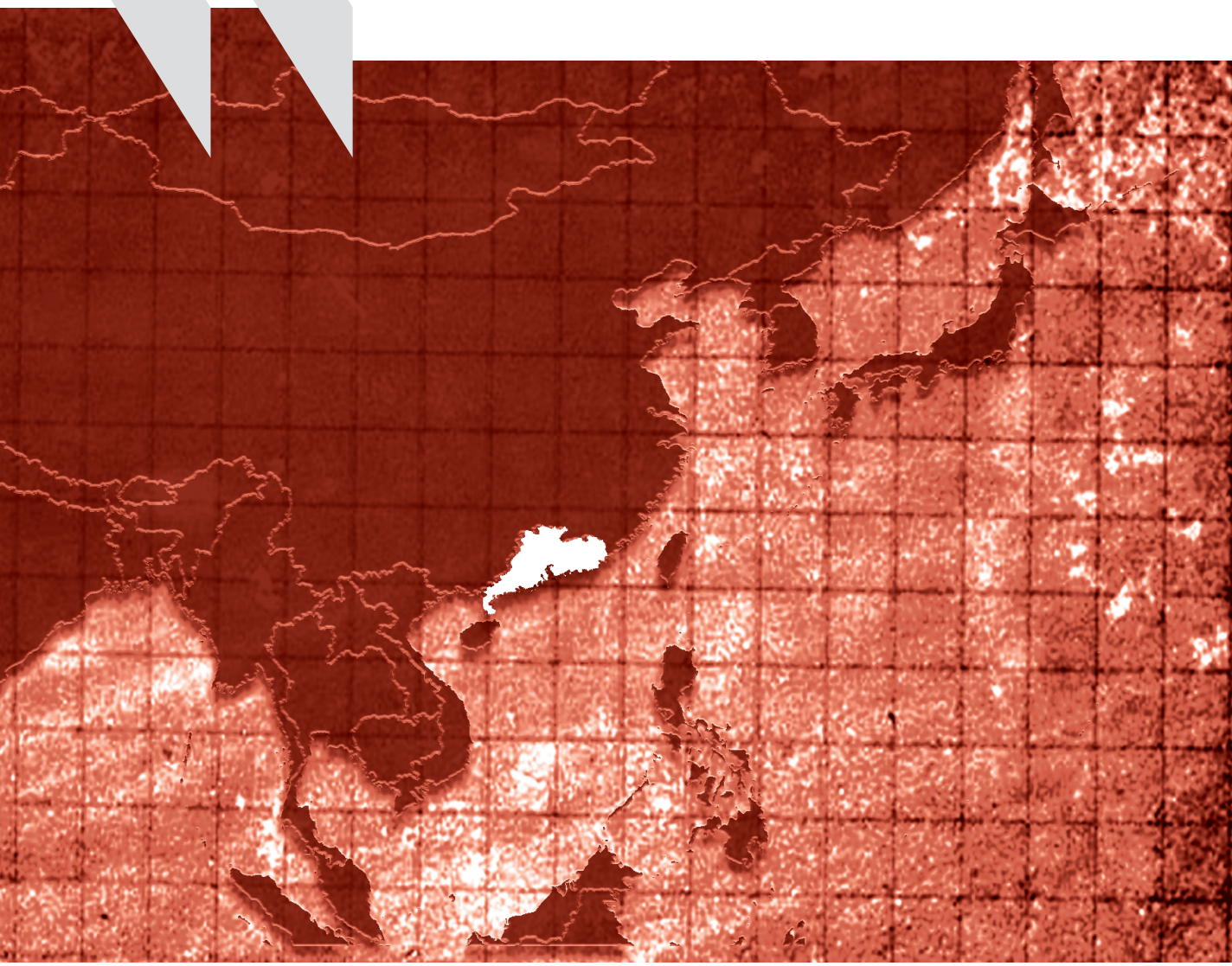
OECD Territorial Reviews

GUANGDONG, CHINA



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Foreword

Across the Organisation for Economic Co-operation and Development (OECD), globalisation is increasingly testing the capacity of regional economies to adapt and exploit their competitive edge, while also offering new opportunities for regional development. This is leading public authorities to rethink their strategies. Moreover, as a result of decentralisation, central governments no longer have the sole responsibility for development policies. Effective relations between different levels of government are now required in order to improve the delivery of public services.

The need to pursue regional competitiveness and governance is particularly acute in metropolitan regions. Although they produce the bulk of national wealth, metropolitan economies are often held back not only by unemployment and distressed areas but because opportunities for growth are not fully exploited. Effective metropolitan governance is called for if a functional region as a whole is to reach its full potential.

In 1999, the OECD, responding to a need to study and spread innovative territorial development strategies and governance in a more systematic way, created the Territorial Development Policy Committee (TDPC) and its Working Party on Urban Areas (WPUA), as a unique forum for international exchange and debate. Among the activities the committee has developed are a series of case studies on metropolitan regions that follow a standard methodology and common conceptual framework. This allows countries to share their experiences, and is intended to produce a synthesis that will formulate and diffuse horizontal policy recommendations.

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Table of contents

Tables

Figures

Boxes

Acronyms

CEPA	Closer Economic Partnership Agreement
CLC	County-level city
DRP	"Double Relocation" policy
ER	Eastern Region
FYP	Five-Year Plan
GD	Guangdong
GDP	Gross domestic product
GDPG	Guangdong provincial government
GDPST	Gross domestic product from secondary and tertiary sectors
GIS	Geographic information system
GPRD	Greater Pearl River Delta (including Hong Kong, China and Macao, China)
LME	Large and medium-size enterprise
MNC	Multi-national corporation
NDRC	National Development and Reform Commission
NR	Northern Region
NUTS	Nomenclature of Territorial Units for Statistics
OEM	Original equipment manufacturer
PLC	Prefecture-level city
PLC-U	Urban area of PLC
PRD	Pearl River Delta
SAR	Special administrative region
SEZ	Special economic zone
SME	Small and medium-size enterprise
TEU	Twenty-foot equivalent unit (container)
TVE	Township and village enterprise
WR	Western Region
YRD	Yangtze River Delta

Assessment and recommendations

The most populous region of China…

Guangdong is China's most populous province. With 95.4 million inhabitants, its population size, which represents one-third of that of the United States, and 75 to 90% of that of Japan and Mexico, exceeds all other OECD member countries. The total land mass of the province is almost equal to that of the United Kingdom. Unsurprisingly, the density is strikingly high, actually the highest among China's provinces, and above that of all OECD member countries. This high concentration of population is linked to a deep urbanisation process (a 63.4% urbanisation rate compared to the national average of 46%) whose rate over the last two decades is probably unprecedented in human history. Chosen as a test bed for a wide range of economic reforms when China introduced the "Open Door" policy in 1978, Guangdong has transformed itself from a backward agricultural, lagging region into a dynamic industrial-based economy. Attracted by massive job creation, a sustained inflow of rural migrant workers from other provinces has fuelled Guangdong's high annual population growth, which over 1990-2008, stood at 2.8%, i.e. more than 3 times China's average and 4 times the OECD average.

… and the richest economy

Guangdong is also the largest economy in China and has been the principal driver of the national economy over the last 30 years. Since 1981, the province has registered one of the highest output growth rates in the nation, with an annual average of 13.7%, *vis-à-vis* a national level of 10%, increasing its share of national GDP to reach 12% in 2008. With a GDP of USD 940 billion, Guangdong's economic size is almost equivalent to that of Australia and Turkey (GDP, PPP). Within the province, a number of cities serve as engines of growth, the provincial capital of Guangzhou, the financial hub and high-tech city of Shenzhen, and the manufacturing base of Dongguan, to name a few. Together with several other large cities, they contribute to the prominent economic position of the Pearl River Delta (PRD), a cluster of 9 cities that concentrates half of the total population of the province (47.7 million) and 79.4% of the provincial GDP. The Pearl River Delta is often referred to as the "manufacturing hub of the world".

A success based on an externally oriented economic model

Guangdong's success has been built on its externally oriented model, characterised by a high ratio of trade to GDP and high FDI inflows. Thanks to its strategic geographical location, i.e. China's southern gateway, leading to Hong Kong, China and Macao, China, three "special economic zones" (SEZs) were introduced in Guangdong in 1980 (Shenzhen, Zhuhai and Shantou). The SEZs benefited from a range of incentives

designed to gradually introduce foreign investment and technology in China. Initially, there were limited spillovers from the SEZs to other parts of the region. However, several factors have led to a massive relocation of Hong Kong, China firms throughout the PRD, including: the pursuit of reforms in the early 1990s; improved regulations and increased decentralisation; the acceleration of globalisation of supply chains which relocated component manufacturing to developing countries; the return of Hong Kong, China and Macao, China to China; and cheaper land and labour costs, including fiscal and regulatory advantages offered in the special economic zones and the other types of development zones that have been introduced over time. The Guangdong economic model evolved towards that of a "processing trade", which allows companies to benefit from importing, assembling, and re-exporting via Hong Kong, China. During the 1990s, investors from Chinese Taipei and multi-national corporations (MNC) from Japan, the United States, and Europe gradually began to locate in other parts of the PRD as well. Guangdong therefore became one of the main receivers of China's incoming FDI (25% of China's total FDI from 1978-2008, in cumulative terms). Virtually all of the manufactured outputs were exports. This allowed Guangdong to become the largest exporting province in China (28.3% of China's total exports in 2008), and also remarkable internationally, i.e. Guangdong's goods exports are larger than that of the Russian Federation.

An economic model that has peaked

Guangdong's past success cannot mask the increasing challenges it is facing today. How to: *i)* upgrade the economy; *ii)* deal with strong internal disparities; and *iii)* address huge environmental challenges, have become pressing issues.

An urgent need to upgrade the economy

i) The first pressing issue for Guangdong is to move up the value chain. In relative terms, Guangdong has witnessed a slowdown in productivity growth, raising concerns about Guangdong's competitiveness in an evolving global economic environment. Despite double digit growth in industrial output since the early 1990s, the productivity level declined slightly over 2003-2005 and has remained steady since then. Relocation, outsourcing, and off-shoring activities into the PRD region have given rise to a surge in manufacturing, which evolved into a range of generally low value-added light industries in textiles, toys, footwear and simple electronics. Such an "export processing" system depends on the simultaneous import of primary goods and the export of manufactured goods. Recent trends point to increasing challenges for manufacturing in Guangdong from rising labour costs to the limited availability of land, all within a context of increasing competition for lower value-added goods and commodities from other regions in China and emerging countries like Vietnam, Indonesia, Bangladesh, and India. The sustainability of an economic model based almost entirely on value-added exports has also been recently questioned by the strong impact of the recent global economic crisis on the province. Previous double-digit growth rate of exports and FDI turned negative over late 2008-early 2009, with some cities like Dongguan and Zhuhai experiencing a deep contraction in demand that led to negative growth in early 2009. Widespread factory closures and massive job losses were also reported (e.g. 590 000 migrant workers in 2008). While the recent period signals recovery, these past trends have pointed out the need to climb the value chain and to reduce the strong reliance on exports by focusing more on domestic demand.

An emerging internal competitor: the Yangtze River Delta

The Guangdong economic model is not only challenged by external factors but also by rising internal competitors, especially the Yangtze River Delta (YRD) with Shanghai's re-emergence as China's principal metropolis. The widespread reforms of the 1990s that benefited Guangdong also unleashed productive capacities that led to more rapid growth and deeper structural changes in the YRD. While Guangdong contributed an additional 5.4% to China's GDP, reaching 12.5% in 2007, up from 7.9% in 1990; the YRD's share increased from 15.5% to 22.7% (an additional 7.2%) over the same period. Moreover, as the YRD began to develop in the 1990s, its productivity level began to surpass Guangdong's. Once well behind Guangdong in terms of the share of China's total FDI (24% in 1990 versus 42% in Guangdong), the YRD stood at the same level as Guangdong in 2000 (27%). The YRD now also contributes a larger share to China's industrial production (25% versus 13% in Guangdong). A large portion of this difference is explained by rising productivity in the YRD resulting from specialisation in higher value-added production than in Guangdong and a capacity, like Beijing and Tianjin, to attract far more durable and forward-looking FDI with profits that, though accruing later, are being re-invested locally.

The highest internal regional disparities in China

ii) The second pressing issue for Guangdong is that its economic model has generated high internal disparities. The province contains four territorial regions: Eastern Guangdong, Western Guangdong, Northern Guangdong, and the Pearl River Delta region (PRD) in the south. The PRD region, with half of the total population generates 79.4% of the whole provincial GDP. The Northern Guangdong region has a per capita income among the lowest in China, while the PRD region is among the highest. Disparities are mainly the result of an imbalanced distribution of foreign investment. This is illustrated by estimates showing that more than 90% of foreign enterprises in Guangdong locate in the PRD region, and seven-eighths of USD 800 billion FDI utilised by Guangdong over the past 30 years has been invested in the PRD region. The major reason for concentration in the PRD region is its proximity to Hong Kong, China which stands out as the dominant FDI source (62%) in Guangdong. Cost reduction and short travel distance are two major criteria for low value added and labour-intensive Hong Kong, China firms to choose investment sites. The PRD region offered a sufficient supply of un-skilled and semi-skilled workers, affordable land prices, and limited travel distance to Hong Kong, China. Therefore, with less than one-quarter of provincial territory, the PRD's GDP per capita is four times higher than the least developed regions in Guangdong province. Within the PRD, most of the dynamism comes from the three largest metropolitan regions (GuangFo [Guangzhou and Foshan], Shenzhen and Dongguan), which account for almost 64% of the provincial economy and 8% of the Chinese economy. The strong performance of these metropolitan regions has occurred hand in hand with increasing urban rural disparities, e.g. net income difference between urban and rural reached 3.78:1 in 2006, up from 2.8:1 in 2002.

Rapid development has generated considerable environmental concerns …

iii) The third pressing issue is that Guangdong's development model has generated considerable environmental issues that threaten its ecological system and resources, its inhabitants and its economy. The extraordinary rate of urban and industrial growth in Guangdong province has resulted in high levels of energy consumption, with Guangdong's total energy consumption having almost tripled over 1997-2007, and doubled since 2000. High energy consumption translates into high greenhouse gas emissions, as coal and crude oil accounted for 76% of energy sources in 2007. While the province's industrial production, 82% of which is concentrated in the Pearl River Delta region, is responsible for a large share of emissions, energy inefficient buildings and transportation modes, and sprawling urban growth patterns also contribute greatly to energy consumption. Building energy consumption in Shenzhen accounts for 30% of total energy consumption in the city, and 35% of the province's total electricity power load is used by air conditioners during the summer. From 1990 to 2000, built-up land area in the Inner PRD grew by over 300% in a pattern of sprawl that was hitherto unknown in China. Industrial and urban activities have also taken a toll on the water quality of the Pearl River Delta watershed. In 2008, 35.1% of river segments in the province were polluted, and the Pearl River Delta region was home to all waterways classified as extremely polluted. Energy shortages and high levels of air and water pollution threaten to limit urban development and discourage foreign investment, particularly in industries higher up the value chain; in China as a whole, damages from air pollution represent 3.8% of the GDP, and water pollution can cost nearly 2% of GDP.

…in the context of high vulnerability to climate change.

Contribution to climate change through high levels of greenhouse gas emissions is accompanied by a vulnerability to climate change impacts due to rising sea levels, higher urban temperatures and more extreme precipitation and storm surge events, particularly in the low-lying areas of the Pearl River Delta where economic activity is concentrated. For example, by 2050 flooding in the province is expected to increase by about 50% and sea levels are predicted to rise 30 centimetres. This will put cities such as Guangzhou, Zhuhai and Foshan at serious risk of flooding.

A forward looking strategic vision from the central and provincial public authorities…

The provincial government of Guangdong has been aware of the competitiveness challenges and has developed an ambitious plan to move forward. More specifically, as displayed in the Guangdong 11th Five-Year Plan (FYP), the provincial strategy is based on two main pillars: *i)* upgrade the industrial base through "Establishing Modern Industrial System" programme, targeting the development of modern service sectors, high-tech industries, and high value-added manufacturing; *ii)* develop lagging non-PRD regions through the "Double Relocation" policy, aiming at moving low value-added factories and low-skilled labour force to lagging peripheral regions in the hope of benefiting from lower labour costs, raw material prices, and greater land availability while releasing land in the PRD. This vision has been reiterated in the "Outline of the

Plan for the Reform and Development of the Pearl River Delta region 2008-2020" (Outline for PRD), the first central government sub-provincial regional development strategy produced in the People's Republic of China's history.

…based on an ambitious investment plan to help move up the value chain,…

i) The **"Establishing Modern Industrial System"** Programme mainly targets the development of pillar industries primarily in heavy manufacturing industries (e.g. automobile, shipbuilding, petro-chemical), supported by investment in hard infrastructure transport projects and energy supply. The main policy instruments include investment attraction measures in various development zones operated by provincial, municipal or township governments, including fiscal deductions, low-cost land, better physical infrastructure, relatively flexible administrative procedures, etc. The breakdown of spending from the stimulus package (named as "New Ten Projects") launched in 2008 for the period 2008-2012 is as follows: out of CNY 2.27 trillion (USD 324 billion) 28% will go to the transport network (PRD inter-city transit, subway, expressway, Hong Kong-Macao-Zhuhai bridge), 24% to energy security (thermal and nuclear power plants) and 21% to heavy manufacturing industries (shipbuilding, petro-chemical, steel, automobile). Only 8% of the package has been allocated to advanced services (e.g. Guangzhou Financial Innovation Service Zone) and high-tech industries (e.g. LCD TV display module).

…and a large scale spatial relocation plan.

ii) The "**Double Relocation" policy** is composed of two main actions: *i)* moving the labour-intensive, resource-consuming processing industries from the central PRD to less developed areas, such as Northern, Western and Eastern Guangdong; *ii)* favouring the transfer of workers formerly engaged in agriculture in non-PRD to work in the secondary and tertiary sectors, and improving their skills through training. The principal tool for implementing the "Double Relocation" policy is the creation of "industrial parks" which should attract firms to selected locations in lagging regions. A total of CNY 40 billion (USD 5.7 billion) has been allocated for the whole programme over the period 2008-2012, including CNY 22.5 billion (USD 3.21 billion) from the provincial government, of which 67% is for the construction of parks, 22% is for the training programme for migrant workers, and 11% for subsidies to firms. Major tasks are to build infrastructure for the 28 current industrial parks in the non-PRD, provide incentives to firms to relocate (e.g. subsidies for firms to upgrade their technologies should they accept to relocate) and a specific proportion is dedicated to train the labour force in the lagging regions (e.g. subsidies for training programmes). Released rural labour is encouraged to take jobs locally in the new industrial parks. In order to ensure implementation, the "Double Relocation" policy has been introduced into sub-provincial level annual government employees' performance evaluations, i.e. linked with promotion of government officials. Although the DRP is the first of its kind in China, territorial relocation in Guangdong started at least a decade ago. This is demonstrated, for instance, by the development of the "Specialised Town Programme" in rural non-PRD. Launched in 2000, this programme is based on the concept of "one town, one product", i.e. specialisation in one specific item or a limited range of similar products. Industries in towns that acquire the official label of a "specialised town" can benefit from direct subsidies and preferred

supplier status for public procurement contracts. Over time, this programme has increasingly benefitted cities in the non-PRD (38% in 2003 to 60% in 2008).

There are limits to the current approach…

The provincial strategy is an ambitious plan aimed at promoting principles of both "excellence" and "harmony". However, experience in OECD member countries shows that some of the policy tools featured in the strategic framework for Guangdong have produced mixed outcomes.

… including insufficient focus on soft assets and regional specificities…

Despite massive government-led investments, challenges lie in how to improve attractiveness to high value-added activities. There appears to have been two main drivers of Guangdong's productivity growth in the last decade: *i)* increased share of higher value activity in ICT, whose share in Guangdong's industrial output value grew by 7% over 2000-2007; and *ii)* an important shift from light to higher value-added heavy industry, which grew by 6.4% during this period. Such trends seem to occur only in a limited number of areas in the province, e.g. Guangzhou which has attracted heavy industry investment from Japanese automobile manufacturers Honda, Toyota and Nissan since late 1990s; Dongguan, the city that boomed by processing trade industries, established the Songshan Lake Park innovation development zone in 2001, to attract high-tech and innovation-oriented companies. Doubts remain regarding the capacity of the current sectoral approach – focusing on pillar heavy industries, investment in hard infrastructure and subsidies to firms – to overcome Guangdong's challenges in moving up the value chain and reducing regional disparities. More attention could be paid to the soft assets (skills and innovation) that are necessary to attract and develop high value-added activities and to sub-regional specificities.

…which might not help industrial relocation materialise

Although the "Double Relocation" policy is a comprehensive governmental policy to foster more balanced regional development in the province, experience in OECD member countries indicates that an exogenous approach to redirecting the location of economic activities produces only marginal results. In particular, the development of subsidised industrial parks in remote regions has proved to be extremely costly and largely ineffective in many countries. Today, low value-added manufacturers are more likely to relocate to other coastal locations in southern China – Beihai, Fengchenggang in Guangxi, Fujian, and the Yangtze Delta Region – where there are more dense agglomerations of suppliers (including of labour), and where they have better access to export markets through coastal container ports, than in peripheral regions of Guangdong where these export-oriented advantages do not exist. Similarly, labour tends to migrate to areas with the widest range of employment options, and where aggregated demand pushes wage rates higher. While the "Double Relocation" policy is focused on engaging local residents in receiving locations to take up the expected new non-farming employment, a huge divergence in skills and knowledge exists between the PRD core and Guangdong's periphery. Attracting skilled migrant workers to Guangdong's periphery will be difficult as firms are more likely to be attracted to locations where there is at least a semi-skilled

labour force rather than relying on a supply driven by government efforts in training local workers from a relatively low base.

Looking ahead: developing a regional development approach

The implementation of the current policy framework could well benefit from some elements of the OECD's "new paradigm for regional development". This requires incorporating into the current strategy measures focused on developing soft endogenous assets and that leverage the regional dynamics. More precisely, they could include the following:

Strengthening human capital is key…

i) Capitalising on innovation and skills as the main drivers of regional growth and industrial upgrade

Industrial upgrade and innovation activities in Guangdong depend in part on the ability of the province's human capital to meet the demand. Although Guangdong has an abundant supply of qualified human capital to work in labour intensive industries, the province seems to lack sufficient advanced human capital to engage in higher value-added industries. Comparisons with other provinces reveal that the percentage of people with college and higher education in Guangdong (5.5%) is lower than the national average (6.2%); the percentage of Guangdong residents with a secondary education (14.5%) is higher than the national average (12.1%) yet lower than Beijing (24.2%), Shanghai (24%) and Tianjin (20.2%). Within the province, there are huge differences in both vocational training and university education attainment. Knowledge-intensive industries and services are only likely to be attracted to provincial cities with high concentrations of university graduates – Guangzhou (16.8%) and Shenzhen (14%) while county-level cities, particularly in Western Guangdong have very low vocational education attainment rates, suggesting that they will be hard-pressed to attract medium value-added industries.

…as is developing regional innovation systems

Innovation is one of the structural weaknesses to be addressed in Guangdong. Although Guangdong is already in a strong position within China for high-tech trade, one of the challenges for the region will be to improve its innovation capacity in order to seek and restructure its economy to higher value-added manufacturing. While Guangdong has considerably increased R&D intensity by incrementally increasing the volume of investment, the cumulative R&D spending on a per capita basis remains lower than some other Chinese regions. To boost knowledge creation capacity, a target has been set by the provincial government to increase R&D intensity to 2.0% by 2012, up from the current level of 1.41% (2008), (the OECD average was 2.26% in 2006). In order to improve the innovation performance of the province, currently mainly led by the private-sector, and attract higher quality FDI, the region needs to better develop its knowledge generation infrastructure. Improvements in co-operation between public research organisations, universities, large firms, and small firms will also be needed to improve the productivity of the regional innovation system. Currently, one of the main public instruments to foster innovation is the innovation platform that is part of the Specialised Town programme.

However, the evaluation so far has highlighted difficulties in increasing co-ordination between universities and in promoting the idea of risk sharing among firms. More efforts could be made by the public sector to support innovation through grants for start-up and the establishment of intermediate institutions for SMEs.

Partnerships with Hong Kong, China should be pursued

Further developing partnerships with Hong Kong, China is key to fostering better knowledge generation capacity. Hong Kong, China's innovation capacity is relatively underdeveloped compared to Singapore, Japan and Korea, as measured by patent applications per million inhabitants according to the World Intellectual Property Organisation (WIPO). In 2005, Hong Kong, China's R&D intensity (0.81%) was only a third the rate of Singapore (2.4%). However, Hong Kong, China has unique advantages that Guangdong does not have in attracting high quality researchers, including a pool of highly qualified scientists and top-ranked universities (fourth in Asia). As Hong Kong attracts highly skilled human capital, more benefits could be achieved for Guangdong through partnering with Hong Kong, China. The current "Hong Kong-Shenzhen Innovation Circle" is a co-operation agreement that mainly sets out a co-ordination mechanism for technology issues, and also encourages students and researchers to exchange ideas and create joint laboratories and/or conduct joint research on specific topics. The co-operation agreement is expected to provide the platform for talent attraction.

Focusing on the Outer PRD first could help

ii) Focusing on the Outer PRD as a first step of the "Double Relocation" policy

Within the PRD, population and economic activity are highly concentrated in a core area, the Inner PRD (75% and 88% respectively). Despite its emerging locational advantages, the Outer PRD, is currently under-settled (one-third of the population of the Inner PRD), under-urbanised, under-industrialised, and under-served by high-speed roads (54% of the density of high-speed roads by 2020/2030 of the Inner PRD). Drive-time analysis demonstrates that parts of the Outer PRD are becoming more accessible to strategic logistical and distribution hubs in Guangdong and Hong Kong, China. Its land prices are significantly lower than in the Inner PRD. The drive-time analysis also suggests that accessibility will only be improved in the non-PRD to a limited extent by 2020/2030. Rather than covering all non-Inner PRD regions, as a first step, the "Double Relocation" policy could be adjusted to foster agglomeration economies in the Outer PRD. This would require careful planning of additional expressway links and feeder roads, sufficient supply of industrial land that would keep prices affordable to low and medium value-added firms relocating from the Inner PRD and adequate levels of infrastructure services in the new industrial developments.

Fostering endogenous growth in lagging regions is essential

iii) Promoting endogenous growth in lagging regions

A more viable approach to develop the peripheral regions is to target measures that strengthen existing endogenous assets. Existing industrial specialisations are already growing in importance, in three of four municipalities in the Eastern Region, three of five in the Northern Region, and all three in the Western Region. Rather than trying to induce export-based firms to relocate from the Inner PRD, the government of Guangdong might consider redirecting its investments and policy efforts to strengthening existing comparative advantages in the core industries of those cities and towns in peripheral regions. This would require developing a regional development policy approach taking into account the local comparative advantages and specific territorial weaknesses. Promoting the development of lagging regions areas requires prerequisite levels of public service provisions. While the "Double Relocation" policy points in this direction, e.g. training for rural migrant workers and providing transport infrastructure, more action could be taken to improve housing for workers and people, health care and social services, public utilities services and other services to individuals and firms. Guangdong might be inspired by the experience of some OECD member countries, like Italy, which has been suffering from serious territorial disparities. There, incentive mechanisms have been set up to increase the commitment of local authorities to achieve objectives laid out for selected public services areas.

Environmental issues need to be addressed systematically…

Although current planning documents include an environmental component, efforts to improve environmental quality need to be more systematic and better linked with competitiveness and equity objectives. Concrete actions have been taken to reduce energy consumption and increase energy efficiency. The province of Guangdong and its cities, particularly Guangzhou and Shenzhen, are key national energy consumers and centres of energy-intense production, but are also becoming key leaders in increasing energy efficiency, switching from fossil fuels to renewable energy, and developing new low-carbon technologies. The province of Guangdong is funding research in energy conservation, renewable energy and pollution abatement technologies, while Shenzhen, the first city in China to release building energy efficiency regulations, has also created medium and long-term energy conservation targets. Guangzhou has established local energy conservation targets for the 150 energy-intensive enterprises that contributed 65% of the city's total industrial energy consumption, and has also set an ambitious goal for private and public sector funding for its renewable energy plan. However, these efforts appear to be not enough, given that environmental indicators only have marginal improvement. Total energy consumption, especially from coal-fired power plants, is still rising despite major improvements in energy efficiency. Despite Guangdong's high vulnerability to the major effects of global climate change, to date neither Guangdong provincial, municipal, or Hong Kong, China governments have prepared climate change adaptation strategies. In the medium term, climate change will have serious impacts on the most economically active areas of Guangdong; without adequate adaptation measures, these impacts will exacerbate the province's declining competitiveness in attracting innovation-based and capital-intensive manufacturing and services firms.

… as does co-ordination on environmental quality among cities in the PRD and across Guangdong province.

To broaden and sustain the impact of existing measures, energy and environmental targets need to be better aligned at the city, provincial and national levels, and the evaluation of lower level officials based on environmental criteria should be systematically implemented. Incentives for inter-municipal co-ordination at the local level (e.g. grants for inter-municipal responses, or pre-conditions for infrastructure financing) are needed to improve responses to wastewater and other pollution problems that fall under each municipality's responsibility but affect others in the region. Connecting areas of new and existing urban growth through networks of mass transit as well as rail and road infrastructure, and orienting new development around mass transit infrastructure, will lay the groundwork for future economic growth while decreasing the environmental impact of this growth and better connecting the workforce to future employment opportunities. Policies to abate air pollution need to move beyond accords with industries to more stringent standards across the province, thereby preventing "pollution havens" in less well-regulated areas of the province. While policies to increase mass transit and innovative alternative fuels can help reduce transportation emissions, a more comprehensive approach is needed that concentrates on reducing the need for vehicle travel through density policies and imposing costs on vehicles during peak hours – both of which have been shown by OECD modelling not to harm local economic growth in the long term. Similarly, water management in the Pearl River Delta needs to be approached systematically, as wastewater discharges and industrial and agricultural pollution affect water quality and sources throughout the region. Finally, concrete measures are needed to prepare for and adapt to the potential climate change impacts. While Shenzhen's monitoring system an important early step, severe storm surge, rainfall and heat events scenarios need to be incorporated into infrastructure and urbanisation plans now to increase the long-term climate resilience of the built environment.

The opportunity for a green growth strategy: the Green PRD

A green growth strategy could be a key means to reach the objectives of upgrading the economy whilst addressing equity and environmental quality. Attracting green industries, investing in green infrastructure and renewable technologies, and improving the eco-efficiency of existing industries and buildings could create a significant number of jobs and at the same time strengthen regional competitiveness. Guangdong province has an enormous opportunity to create jobs and reduce environmental impact if it incorporates into its long-term planning the goals being developed by Hong Kong, China and Guangdong province in the forthcoming Green Pearl River Delta Living Area Plan, which is expected to provide a strong vision and strategy for green growth in the Greater Pearl River Delta. In particular, the plan's focus on cleaner industrial production, increasing building energy efficiency, improving air quality, increasing recycling and attracting green businesses takes advantage of the job growth potential in the sectors of renewable energies, recycling, and energy efficiency consulting and retrofitting. Fully participating in the Plan for a Green Pearl River Delta, particularly the goals of a clean air accord for 2011-2020, collaboration under the vision of a "Green PRD Quality Living Area", and expanding the Cleaner Production Programme to also include non-Hong Kong, China-based firms in Guangdong, would enable Guangdong to fulfil many of the objectives of the Outline for PRD, particularly those related to strengthening of capabilities of independent innovation and promotion of infrastructure modernisation.

Guangzhou's landfill waste-to-energy CDM project, which generates 50 Gwh of electricity annually, and Shenzhen and Guangdong's plans to provide subsidies to solar photovoltaic producers, provide models for mechanisms through which the province and its cities could stimulate green growth.

Rethinking governance in Guangdong

Reforming the governance system is crucial for Guangdong to meet its challenges of upgrading the economy, dealing with disparities and facing with environmental challenges. This features as a priority in both the Provincial 11th FYP and the Outline for PRD. Guangdong's dramatic industrialisation and urbanisation over the past 30 years has subverted the delineation of administrative boundaries (and hence, hierarchies of governance). The lack of consistent planning might have led to diseconomies of scale in duplicated facilities and uncontrolled suburban development. Governance in Guangdong could be improved by: *i)* increased regional co-ordination; *ii)* fine-tuning of planning mechanisms; *iii)* and financial instruments which would help solve Guangdong's policy challenges.

…through improved regional planning…

i) Increase regional co-ordination in the Pearl River Delta

Fierce inter-city competition has led to duplication of infrastructure, wasteful competition for attracting business and poor interconnections between the different parts of the province. For example, there are five international airports in the region competing with each other and a similar situation exists with respect to international container ports. Some areas in the region are inappropriately serviced by roads from adjacent municipalities due to a lack of co-ordinated planning. In order to make a strong transition to a high value-added economy, Guangdong will have to find a new balance between inter-city competition and co-operation within the Pearl River Delta. Higher levels of governments in China could develop incentives to reward inter-city cooperation as is being done in many OECD member countries.

…and increased regional co-ordination within the Greater PRD.

Differences in government structure have complicated cross-border co-operation between Guangdong and Hong Kong, China, yet further integration between the two is estimated to have large positive impacts, up to almost a percentage point of GDP growth per year. The proposals for the "Guangdong-Hong Kong-Macao Close Co-operation Zone" and the recent framework agreement for co-operation between Hong Kong, China and Guangdong could be used to stimulate economic integration. A key to establishing the Guangdong-Hong Kong-Macao Close Co-operation Zone is to give Guangdong the right to be the first to implement the new CEPA initiative (free trade agreement between mainland China and Hong Kong, China). Guangdong could take the lead to establish a Pearl River Delta sub-regional co-operation mechanism. It might also suitably modify its related policies according to the implementation needs of CEPA. The opportunity can be taken to improve its economic and administrative governance with the benefit of CEPA. The new co-operation agreement – "Framework Agreement on Hong Kong/Guangdong Co-operation" (FAHGC) in 2010 sets clear targets and development positioning for Hong

Kong/Guangdong co-operation, including: to promote joint economic development and environmental cooperation in Hong Kong, China and Guangdong to create a new world-class economic zone. The establishment of a light institutional body like the Öresund Committee for the cross-border region of Copenhagen and Malmo could greatly facilitate the implementation of the agreement.

…fine-tuning planning instruments…

ii) Fine-tune planning instruments to avoid sub-urban sprawl

There is a wide spectrum of planning measures in Guangdong, including its Territorial Plan which aims to comprehensively address spatial development challenges and introduce new zoning measures. Despite spatial planning frameworks, sub-urban sprawl and the loss of cultivated land has increased rapidly. This can be attributed to several factors, including compensation for rural land that does not reflect market developments, lack of co-ordination between levels of government and limited monitoring of the spatial plans. The effectiveness of planning could be enhanced by introducing instruments such as urban growth boundaries, density targets and urban design guidelines. There could be stronger co-ordination between different levels of governments on spatial plans and monitoring mechanisms could be improved by introducing land market assessments, future land-use analysis and scenario modelling.

…and more sustainable urban finance.

iii) Use urban finance to achieve environmental sustainability, foster equity and stimulate the transition to a high value-added economy

The main limits to environmental improvement are that taxes in Guangdong province and its main cities are mainly levied on business activity, with limited taxation of land use and the built environment, thus providing limited incentives to constrain sprawl. Fiscal revenue sources could be designed so that they provide incentives for environmental sustainability: land sales could be further limited, proper pricing of environmentally sensitive services could be introduced and smart taxes and fees, such as congestion charges, parking fees and development charges, could be considered. Predictable, long-term fiscal equalisation mechanisms implemented within the province, based on transparent and objective criteria could be put in place that further reduce regional inequities within Guangdong. Relatively little is spent in Guangdong province on expenditure items that could stimulate a rapid transition to a more high value-added economy, such as education and research and development. Finally, public expenditures in Guangdong could be focused more on items that help achieve the goal to move towards a high value-added economy (education, innovation and R&D): the trend of increasing expenditure shares on these items since 1999, with the expenditure share on education rising from 11.7% in 1999 to 15.4% in 2006 (and science and technology from 1.3% to 2.4% over the same period) would have to continue.

Chapter 1

Socio-economic trends in Guangdong

This chapter provides an overview of demographic and economic trends of the province within its national context and as compared with OECD member countries. The first section highlights the rapid and deep urbanisation process of the last three decades which is unprecedented in human history. It shows how rapid industrialisation has generated a model featuring strong spatial concentration of people and firms, and the emergence of the Pearl River Delta, a cluster of nine cities, that concentrates more than half of the total population of the province and which has acquired the recognition of "the World's Factory", since it has the world's largest concentration of low and medium value-added manufacturing. The second part of this chapter highlights the position of Guangdong as the largest economy of China. It shows the remarkable progress experienced in the past 30 years, transforming Guangdong from a backward agricultural economy to a dynamic industrial-based manufacturing economy, by making full use of its geographic proximity to Hong Kong, China, and positioning itself as the largest exporter in the country as well as its main FDI recipient. A review of the different phases of economic development shows how Guangdong has benefited from a privileged position in China, since it was chosen as a test bed for a wide range of economic reforms when China introduced the "Open Door" policy in 1978.

Introduction

Guangdong has long been a key pillar of China's development. Today it is the country's most populous province and its largest economy. With 95.4 million inhabitants, its population size is larger than all OECD member countries, except Japan, the United States and Mexico. The size of its economy is comparable to that of Australia and Turkey. This chapter provides an overview of demographic and economic trends of the province within its national context and as compared with OECD member countries. The first section highlights the rapid and deep urbanisation process of the last three decades which is unprecedented in human history. It shows how rapid industrialisation has generated a model featuring strong spatial concentration of people and firms, and the emergence of the Pearl River Delta, a cluster of nine cities, that concentrates more than half of the total population of the province and which has acquired the recognition of "the World's Factory", since it has the world's largest concentration of low and medium value-added manufacturing. The second part of the chapter highlights the position of Guangdong as the largest economy of China. It shows the remarkable progress experienced in the past 30 years, transforming Guangdong from a backward agricultural economy to a dynamic industrial-based manufacturing economy, by making full use of its geographic proximity to Hong Kong, China, and positioning itself as the largest exporter in the country as well as its main FDI recipient. A review of the different phases of economic development shows how Guangdong has benefited from a privileged position in China, since it was chosen as a test bed for a wide range of economic reforms when China introduced the "Open Door" policy in 1978.

1.1. Overview of the dynamic Guangdong province

Demographics and geography

What is today the Guangdong province has a long history of interacting with the world outside China. With a long coastal line forming China's southern gate, it neighbours five provinces and two special administrative regions – Hong Kong, China and Macao, China (Box 1.1 and Figure 1.1). Guangdong is one of the most southern provinces in China. In a regional context, Guangdong is located right in the centre of China and Southeast Asia, in close proximity to Vietnam, Laos, the Philippines and Malaysia. Guangdong's geography has played a critical role in determining the current distribution of settlements and population across the province (Box 1.1). Its largest habitable area is the Pearl River Delta (PRD) with extensive bodies of water and rivers.

Box 1.1. **Guangdong's topography**

The topography of Guangdong is generally high in the north and low in the south. Mountains make up about 33% of the total land area, hills and smaller mountains 25%, plains make up about 23% and the tablelands make up roughly 19%. There are five major topographic zones: the Northern Guangdong Mountain Area, the Zhujiang Delta, the Western Guangdong Mountainous Tableland, the Eastern Guangdong Mountain Area, and the Chaoshan Plain. The Northern Guangdong Mountain Area rises to an average of 1 000 metres in elevation with the highest peak topping 1 902 metres above sea level. The Zhujiang Delta, or Pearl River Delta, is the general name for the conflation of the Xijiang, Beijiang, and Dongjiang river deltas, where approximately 100 rivers form a dense network of waterways. Many of the rivers and streams empty out into the South China Sea directly through smaller deltas. The Pearl River Delta is composed of these smaller deltas and is the largest plain in Guangdong, occupying a total area of 11 000 square kilometres. The Western Guangdong Mountainous Tableland reaches about 1 000 metres above sea level, and covers the areas west of the Zhujiang Delta and the Leizhou Peninsula. The mountainous areas are filled with open basin areas and river valleys while the Leizhou Peninsula is mostly tablelands and terraces. The Eastern Guangdong Mountain Area rises to 1 300 meters in elevation and includes the Qingyun, Jiulian, Luofu, and Lianhua mountain ranges. The province's principal water source is the Zhujiang River, or Pearl River, the second largest in China, after the Changjiang (Yangtze River). Since most of the province has good access to water, the principal determinant of habitability is its topography. Much of the province's land area has a slope greater than 8° and is therefore unsuitable for extensive habitation or cultivation (Food and Agriculture Organisation of the United Nations – FAO, 1988).

Figure 1.1. **Map of Guangdong's location**

Source: Author's calculations based on data from the OECD *GIS database*, internal database.

The most populated and densest region in China

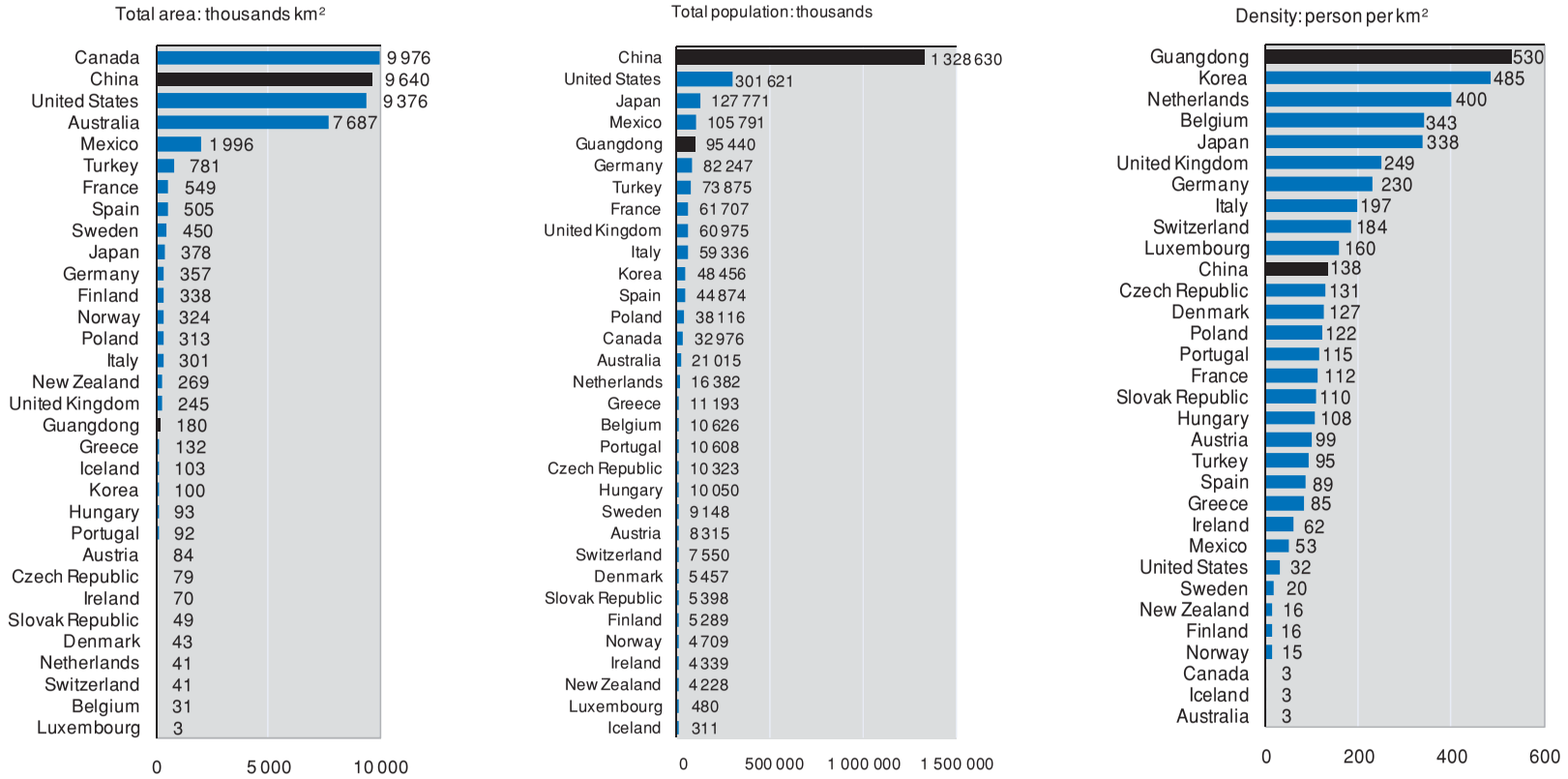
Guangdong is the most populous and densest province in China, with a population exceeding that of many OECD member countries. The landmass, in comparison to other provinces in China, is small – 179 812 square kilometres – totalling just 1.9% of China's total area. However, compared with the size of OECD member countries, Guangdong is slightly smaller than the United Kingdom and larger than Greece and Korea. Guangdong's total population was 95.4 million in 2008, corresponding to 1.6 times the population of Italy, 74% that of Japan, almost one-third the population of the United States, and more than that of almost every other OECD member country (Figure 1.2). It is no surprise, then, that the population density in Guangdong is strikingly high. The 2008 data on population density in Guangdong is 530 inhabitants per square kilometre, higher than the average level of China and that of all OECD member countries.

There are two ways to map the size and location of the actual population in Guangdong: *i)* according to the official administrative sub-units; and *ii)* using the geographical information system (GIS) for a smaller spatial scale.

i) **According to the official administrative definition,** the province can be divided into four major regions: the Pearl River Delta (PRD), the Eastern Region (ER) extending to Fujian and Jiangxi, the Western Region (WR) extending to Guangxi, and the Northern Region (NR) that borders Guangxi, Hunan, and Jiangxi (Figure 1.3). These four regions are the principal territories for which regional development policies are set by the Guangdong provincial government. All four regions could be further broken down by population density and grouping of cities (or prefecture-level cities – PLCs – of which there are 21 in Guangdong) and large towns (Figure 1.4). Both cities and towns are sub-provincial administrative entities in China (Box 1.2).

- **The Pearl River Delta** (PRD) is comprised of an Inner Delta area including Shenzhen, Dongguan, Guangzhou, Foshan, Zhongshan, and Zhuhai PLCs. It also includes an Outer Delta area comprising Jiangmen, part of Zhaoqing and Huizhou PLCs. [1] With the two special administrative regions (SARs) of Hong Kong, China and Macao, China, the region could be considered as the Greater Pearl River Delta (GPRD) (Figure 1.5).
- **The Eastern Region** is anchored by a large cluster of coastal cities and towns, principally Shantou, Jieyang, Chaozhou and Shanwei.
- **The Western Region** is similarly anchored by a coastal corridor of three cities, including Maoming, Yangjiang, and Zhanjiang.
- **The Northern Region** contains five PLCs – Shaoguan, Qingyuan, Meizhou, Heyuan and Yunfu. Given its comparatively low population density and scattered settlements, a core area does not appear to exist in the Northern Region.

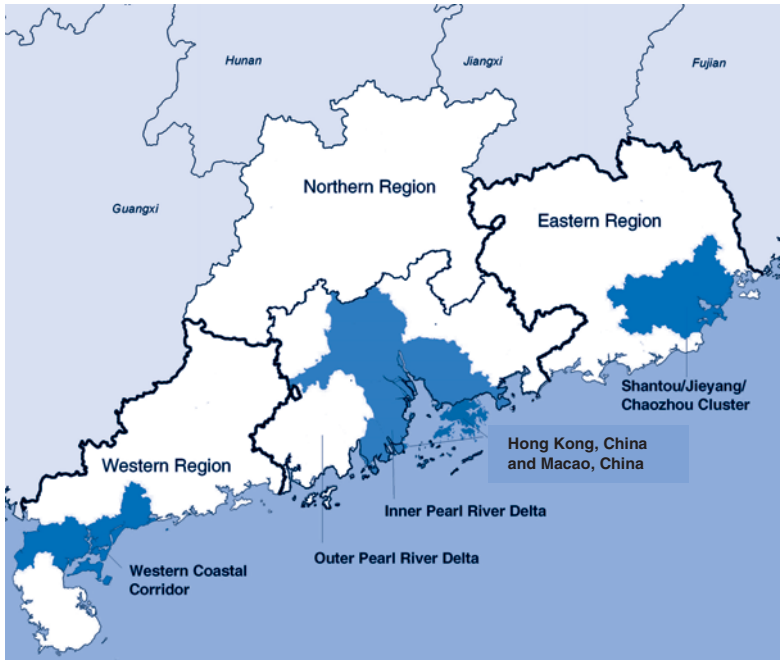
Figure 1.2. **Total area, population and density compared to OECD member countries, 2007**



Note: Data for Guangdong's population and density are from 2008.

Source: OECD (2009), *OECD Factbook 2009*, OECD Publishing, Paris; *National Bureau of Statistics of China database*, *www.stats.gov.cn/english/statisticaldata/yearlydata.*

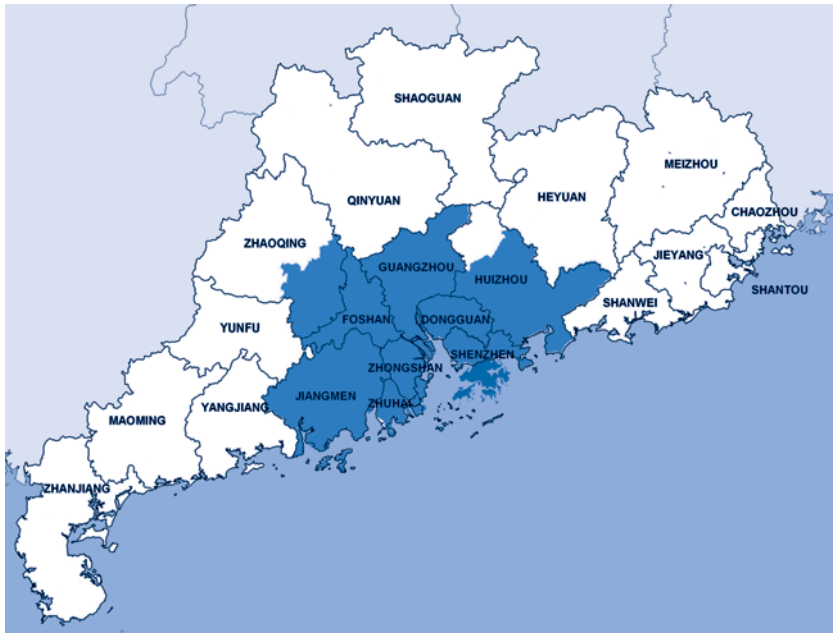
Figure 1.3. **Regions and sub-regions in Guangdong province**



Note: Since 2009, the Outer Pearl River Delta has included the full prefectures of Zhaoqing and Huizhou, following a change in the definition by the Guangdong Provincial government.

Source: Calculations based on data from the OECD *GIS database*, internal database.

Figure 1.4. **The 21 prefecture-level cities in Guangdong province**



Note: The light-blue shaded area is the Pearl River Delta. Since 2009, the Outer Pearl River Delta has included the full prefectures of Zhaoqing and Huizhou, following a change in the definition by the Guangdong Provincial government.

Source: Calculations based on data from the OECD *GIS database*, internal database.

Box 1.2. **Types of sub-provincial administrative entities in China**

China's unitary structure of governance is a hierarchical system through which functional responsibilities are delegated from the central to provincial governments (second tier); followed by a third tier of prefectures and prefecture-level cities (PLCs); a fourth tier of districts (only PLCs are permitted to have district governments), counties, and county-level cities (CLCs); and finally a fifth tier of towns, townships, and street committees in cities.

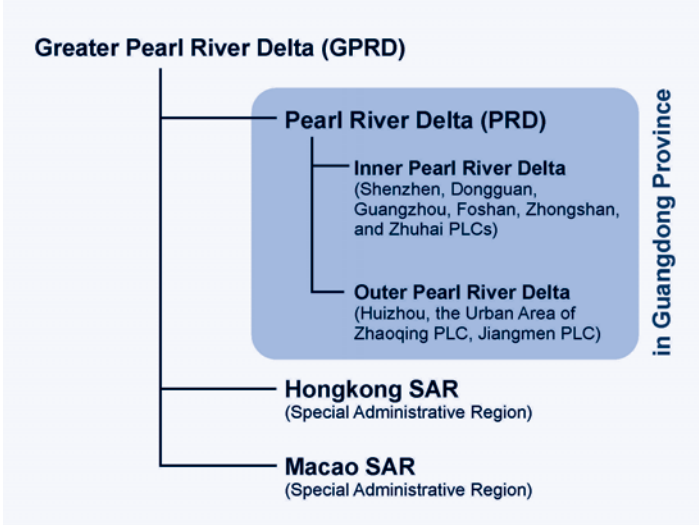
Prefectures are quasi-administrative units dating back to the sub-provincial "Circuits" of the Qing Dynasty. Abolished in 1928, they were resurrected under the "city controlling county" (shi guan xian) system in the late 1950s. In this system, a single city, the prefecture-level city or PLC, administers an entire prefecture, including all counties (and later on, county-level cities). Prefectures have legislated functional responsibilities, but are not defined in the Constitution as a unit of government, and there is no prefecture-level people's congress, the legislative arm of government. PLCs already had demarcated boundaries (roughly equivalent to the size of counties) and municipal governments, including people's congresses. The "city controlling county" system essentially elevated the authority and expanded the functional responsibilities of these municipal governments to the prefecture scale. In prefectures where there is not a city of sufficient size to warrant designation of a PLC, they come under the authority of a prefecture commissioner who reports directly to the provincial government. Although this level of governance appears to have eroded, at least in a functional sense, in many provinces – especially Guangdong – the administrative hierarchy has been maintained since the 1980s. Most PLCs report to provincial governments.

CLCs are towns that serve as county administrative seats. To obtain the designation, CLCs must meet statutory benchmarks established by the State Council. CLCs report to PLCs. With rapid economic growth, particularly at the county level, the formerly prefecture-wide responsibilities of PLCs have been absorbed by constituent counties and CLCs. Sub-municipal structures differ between PLCs and CLCs even though they cover similar spatial territories and, in many cases today, have similar population sizes.

Counties are amalgams of administrative towns that have not met the State Council's criteria for designation as a CLC or district. Districts are sub-municipal administrative entities in urban areas of PLCs; they are at the same administrative level in the Chinese hierarchy as rural counties. Most suburban counties in metropolitan regions in China have been upgraded to districts during the last few years. Districts are allowed only in PLCs. Therefore, PLCs have a de facto two-tiered administrative structure of districts in their municipal government. CLCs are single-tier administrations.

Source: Kamal-Chaoui, L., E. Leman and R. Zhang (2009), "Urban Trends and Policies in China", *OECD Regional Development Working Paper*, 2009/1, OECD Publishing, Paris.

Figure 1.5. **Administrative structure of the Greater Pearl River Delta**



Source: Guangdong Provincial Government (GDPG) (2009), "Background Report of Guangdong", internal background report submitted to the OECD, Guangdong Development and Reform Commission, 29 April 2009, in Chinese.

Almost half of the total population of the Guangdong province live in the Pearl River Delta, illustrating that the PRD is the largest habitable area (Table 1.1). The total population of the Greater PRD is 52 million. The Inner PRD and the SARs are home to 41.2 million people; the Outer PRD has a population of 10.8 million, less than 25% of the PRD as a whole. The Eastern Region (ER) has less than half the population of the Greater PRD (23 million); almost half of the ER's population lives in the Shantou/Jieyang/Chaozhou urban cluster. In the Western Region, the Coastal Corridor holds 4.7 million inhabitants, just over 25% of the WR's 23 million residents. The Northern Region has the largest area of the four major regions, but only 9 million residents, clearly reflecting its mountainous terrain and distance from the coast.

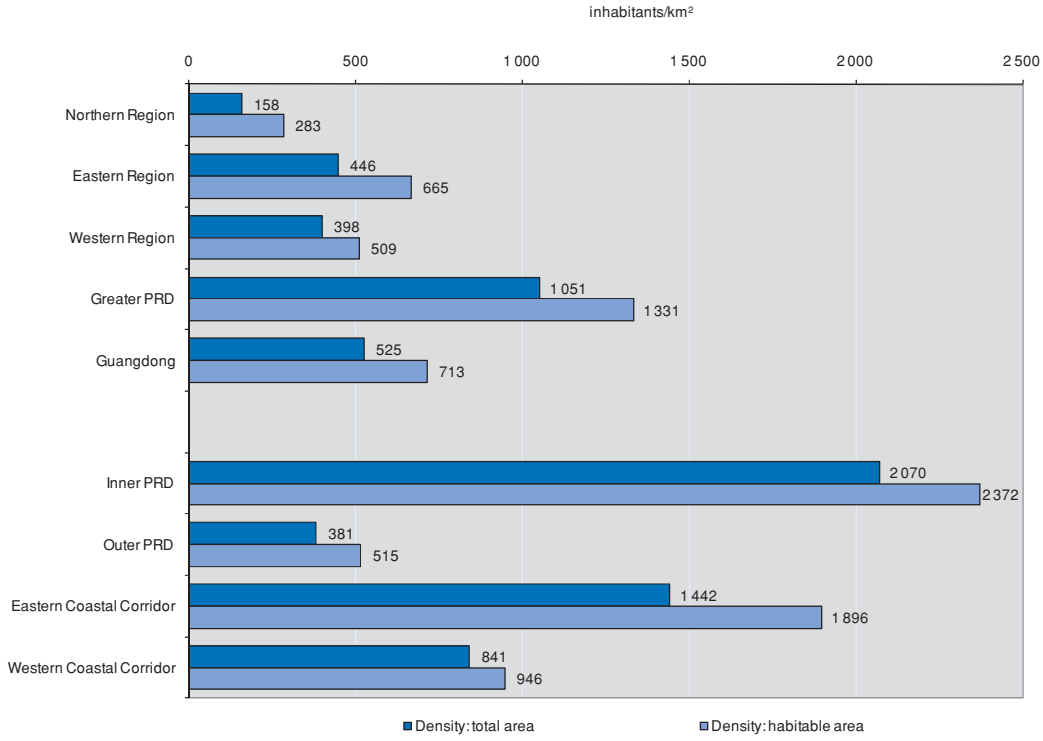
Table 1.1. **Population of administrative regions and sub-regions, 2000 and 2007**

	Population				
	2000	% total	2007 (est.)	% total	% change
Greater Pearl River Delta	47 406 912	51.69	52 030 693	51.2	9.8
Hong Kong, China and Macao, China	6 641 615	7.24	7 155 900	7.04	7.7
Inner PRD	30 939 034	33.74	34 087 455	33.54	10.2
Outer PRD	9 826 263	10.72	10 787 338	10.61	9.8
Eastern Region	20 747 729	22.62	23 043 843	22.67	11.1
Shantou/Jieyang/Chaozhou	10 344 586	11.28	11 185 129	11.01	8.1
Remainder	10 403 143	11.34	11 858 714	11.67	14
Western Region	15 570 535	16.98	17 586 008	17.3	12.9
Coastal Corridor	4 124 831	4.5	4 681 949	4.61	13.5
Remainder	11 445 704	12.48	12 904 059	12.7	12.7
Northern Region	7 980 431	8.7	8 966 638	8.82	12.4
Total: Guangdong + two SARs	91 705 607		101 627 182		10.8
Guangdong province	85 063 992	92.76	94 471 282	92.96	11.1

Source: Guangdong Bureau of Statistics database, *www.gdstats.gov.cn/tjnj/ml_e.htm*; *Hong Kong Census and Statistics Department database*, *www.censtatd.gov.hk*; *Macao Statistics and Census Service database*, *www.dsec.gov.mo*.

To understand Guangdong's high population density in detail, it is useful to explore two types of density in each region (Figure 1.6). The first type of density is based on the entire land area of the region. The second density is for the habitable area of each region and sub-region, defined as land with a slope equal to or less than 8°. The latter is a more accurate measure of the actual density of usable space. Following the latter approach, the Greater PRD is the densest region in Guangdong, and within it, the Inner PRD is even denser; the Northern Region has a population density almost one-fifth that of the Greater PRD; the Western Region's density is 38% of the Greater PRD's, and the Eastern Region is about half as dense as the GPRD. At the sub-regional scale, the Outer PRD is 22% as dense as the Inner PRD, despite its immediate close proximity. The Eastern Coastal Corridor (Shantou-Jieyang-Chaozhou urban cluster) is quite dense, almost 80% as dense as the Inner PRD. The Western Coastal Corridor is 40% as dense as the Inner PRD.

Figure 1.6. **Population densities by administrative region and sub-region, 2007**

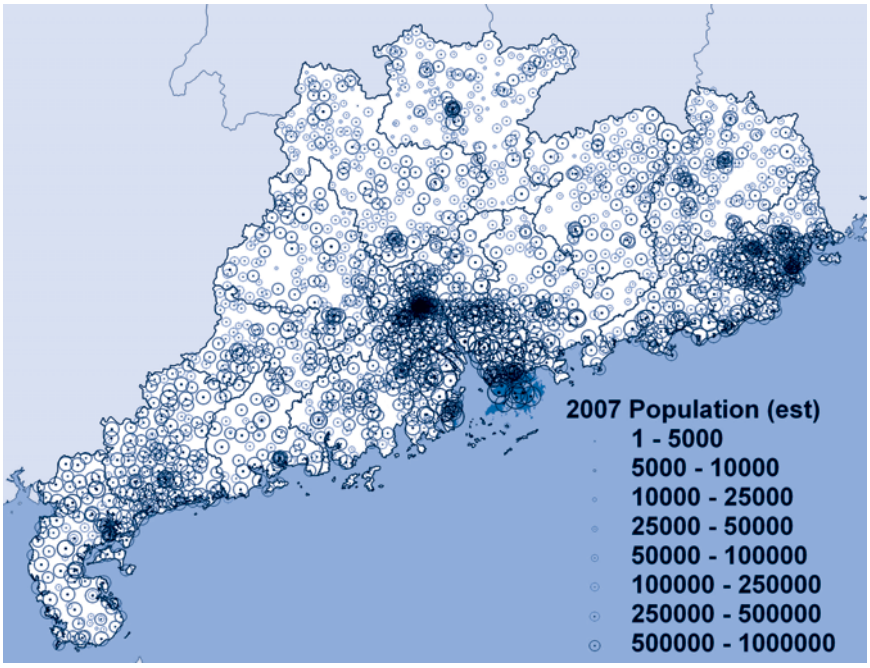


Source: Guangdong Bureau of Statistics database, www.gdstats.gov.cn/tjnj/ml_e.htm; Hong Kong Census and Statistics Department database, www.censtatd.gov.hk; Macao Statistics and Census Service database, www.dsec.gov.mo.

ii) **Adopting a smaller spatial scale with GIS-based analysis** provides a more accurate picture of human settlement densities. While the official approach gives a general picture of the settlement structure, this review adopts another approach to sketch population distribution at the smallest spatial scale possible, in order to understand in detail the territorial dimension of the large, diverse and complex province. Using available data, sub-municipal population size and distribution have been estimated (at the scale of Nomenclature of Territorial Units for Statistics-NUTS 5 in Europe, and the

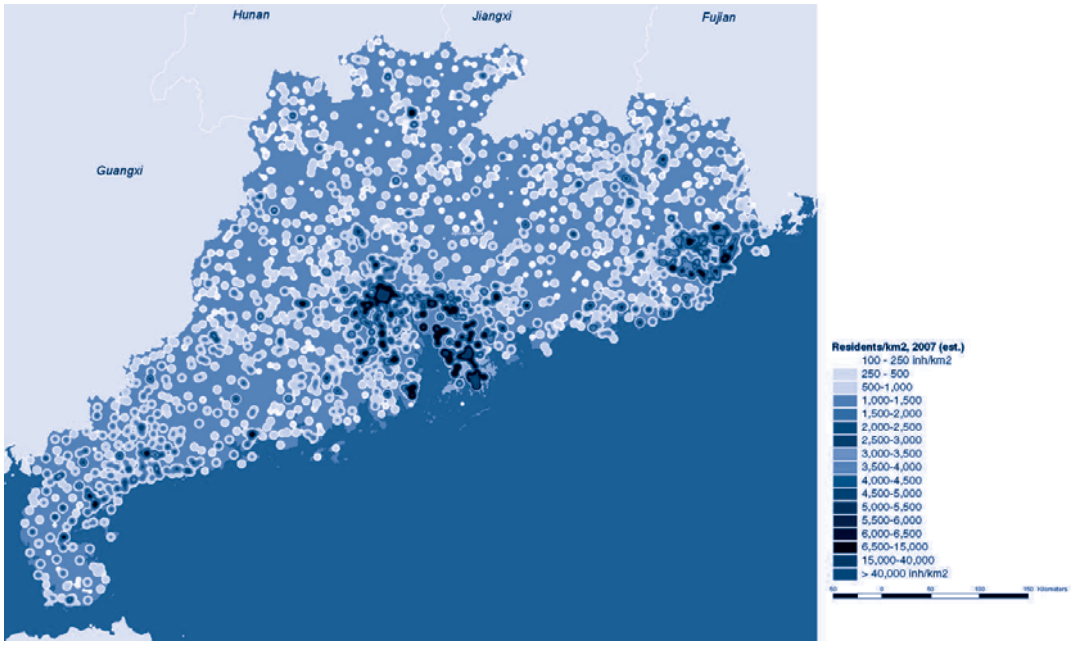
Census Tract level in both the United States and Canada) by combining the small-area data from the 2000 National Census with the similarly derived PLC-level sample survey data from 2007.[2] The 2000 data were plotted spatially on GIS for all 330 street committees, 1 640 statutory towns, and 41 statutory townships in Guangdong.[3] The population growth rates in each of the 21 PLCs from 2000 to 2007, derived from Guangdong official data, were calculated and uniformly applied to all of the small-area units within each PLC to obtain sub-municipal estimates for 2007 that were added to the GIS data (Figure 1.7). While this approach admittedly masks population dynamics within PLCs, it is the only reliable way to derive relatively current estimates, given data constraints. Sub-municipal population data for 2007 for both Hong Kong, China and Macao, China were obtained from their respective statistical agencies, and added to the GIS database. This enabled a consistent, GIS-based calculation of population densities to be estimated for all of Guangdong and the two SARs for 2007 using a small-area spatial base (Figure 1.8).[4]

Figure 1.7. **Prefecture-level cities and statutory towns, townships and street committees in Guangdong province, 2007**



Source: Author's calculations based on data from the OECD *GIS database*, internal database and using geo-referenced data from the 2000 National Census of China, *www.stats.gov.cn/tjsj/pcsj/rkpc/dwcrkpc* and prefecture-level city data from the population survey by the Guangdong Provincial Statistical Bureau, *www.gdstats.gov.cn/tjnj/ml_e.htm.*

Figure 1.8. **Estimated population densities in Guangdong and Hong Kong, China and Macao, China, 2007**



Source: Calculations based on data from the OECD *GIS database* (internal database), using GIS interpolation of data from the 2000 National Census of China, *www.stats.gov.cn/tjsj/pcsj/rkpc/dwcrkpc* and prefecture-level city data from the population survey by the Guangdong Provincial Statistical Bureau, *www.gdstats.gov.cn/tjnj/ml_e.htm.*

This finely tuned approach to mapping population distribution in Guangdong shows how concentrated population is within the PRD. For example, a large portion of the population resides in an area even smaller than the Inner PRD, especially in some parts of Guangzhou, Shenzhen and Hong Kong, China. The most densely populated area could reach 40 000 inhabitants per square kilometre, even higher than the densest municipality in Korea (Yangcheon-gu with 28 809 inhabitants per square kilometre using 2009 data). Large populations also reside on the prefectural boundaries of Guangzhou and Foshan PLCs, as well as Chaozhou/Shantou/Jieyang PLCs.

The most urbanised region in China

The high concentration of population in certain parts of Guangdong results from a deep urbanisation process in the province. In 2008, the official data based on statistical or census-based methodology indicated that the urbanisation rate of the province reached 63.4%, with 60.5 million urban inhabitants, compared to 45.7% nationally (Box 1.3). This is the highest urbanisation level of all Chinese provinces, excluding provincial-level municipalities like Shanghai, Beijing and Tianjin. Nationally, Guangdong is China's largest province in terms of urban population; internationally, the figure is almost equivalent to the entire population of France or the United Kingdom.

Box 1.3. **Official definitions of "urban" and "rural" in China**

In most countries, drawing a line between urban and rural areas is a difficult task, particularly since this line has been blurred in recent decades as the movement of people and the interaction between these areas have increased significantly. For China, this task is even more challenging for a number of reasons. First, China is the world's most populous country so the task must be carried out on a larger scale than in any other country. In fact, China's 2006 rural population of 737 million is nearly twice the size of the rural population in all OECD member countries combined, estimated around 380 million in 2004. Although still a predominantly rural country, with an urbanisation rate just under 20% in the mid-1970s, in absolute numbers, more than 30 years ago China became the world's largest urban nation in human history. In 2008, 606 million urban Chinese constituted 45.7% of the country's population. Second, over the past two decades China has experienced massive urbanisation and cyclical rural to urban migration, which has been characterised by some observers as the largest population migration in peaceful periods of human history. This makes it difficult to determine the extent of the rural population at one given point in time. A third element of complexity is the co-existence of two main official methodologies for measuring the rural population in China: the **administrative or hukou-based** and the **statistical** or **census-based** definition.

The hukou-based methodology is a common source of rural population statistics widely used as a tool by local governments, especially city governments, for population control and management. In the hukou system, people who lived in cities and in the countryside were registered as either non-agricultural hukou or agricultural hukou (sometimes also called **urban hukou** and **rural hukou**). Since the hukou system was set up, the new-born population has been registered according to its parents' hukou status. While at present the system allows for greater flexibility, it has had and continues to have profound social and economic implications given that the hukou identities are attached to social benefits and welfare. Despite its wide dissemination in the various China Population Statistical Yearbooks as a method for quantifying the rural population, the hukou-based methodology has lost much of its meaningfulness as a reference for statistical purposes because many people registered with agricultural hukou no longer carry out this activity and no longer live in rural areas.

Coupled with economic, public finance, and infrastructure indicators, hukou designations are used for the **administrative** designation of urban settlements. Up until 2006, urban settlements in China were administratively defined as statutory cities and statutory towns. From approximately 1950 to the early 1990s, urban residents were those with non-agricultural hukou – regardless of whether they were farmers or dependent on non-farming sources of household income in suburban areas. There are four administrative categories for cities in China: i) provincial-level municipalities (e.g. Shanghai, Beijing, Tianjin, and Chongqing); ii) prefecture-level cities (PLCs); and iii) county-level cities (CLCs). Both PLC and CLC designations are based on population, economic, public finance and infrastructure criteria; iv) a fourth urban designation is used for administrative towns. All territories not defined as urban are considered rural.

It is important to note the limitations of the **administrative** criteria: i) the population base used in calculations excludes migrants and those lacking urban hukou; ii) assessments of urban economic functions are imprecise, for example, gross GDP figures are used, which also include agriculture, mining and forestry; iii) assessments of fiscal capacity are incomplete, as off-budget revenues are not measured; and iv) arbitrary benchmarks are used for infrastructure endowments that have weak functional links to urban economic activity, or to the actual demands of residents for urban infrastructure services. OECD member countries typically do not differentiate between migrants and permanent residents in defining urban populations; similarly, they do not set economic benchmarks in terms of GDP or fiscal capacities in defining cities.

Box 1.3. **Official definitions of "urban" and "rural" in China** (*continued*)

Apart from the **administrative** definition, China has adopted a refined **statistical** definition to bring its definitions of urban and rural more in line with international best practices. First introduced as a draft in 1999 and promulgated in 2006, the "Regulations on Statistical Classification of City and Town Areas" released by the National Bureau of Statistics (NBS) defines urban and rural settlements according to two spatial characteristics: i) contiguity of "urban construction"; and ii) population densities within municipal districts. The latest detailed urban definition is shown in the table below. Non-urban settlements are defined as rural. These regulations formed the basis for defining urban populations in the 2000 National Census, which is considered by many demographers to be the most accurate census conducted since the People's Republic of China was established. For instance, the 2000 National Census for the first time enumerated populations where they actually resided at the time of the census, if they had maintained residence for longer than six months.

Final regulations for the definition of urban settlements, 2006

Administrative area type		Abbreviation	Condition for determining urban classification	Area affected by classification
City area	1	PLC/CLC	Statutory "resident committee" under PLC/CLC	Only the statutory resident committees are "urban"
	2	PLC/CLC	If urban infrastructure and urban public services are **directly** extended to fringe villages in townships	Connected villages are "urban"
Town area	3	Town	Statutory "resident committees" under statutory towns	Only statutory resident committees are "urban"
	4	Town	If urban infrastructure and urban public services are **directly** extended to fringe villages in townships	Connected villages are "urban"
Special settlement	5		Independent settlement (mining fields, development zones, tourist areas, university cities, etc.) with a total population over 3 000 people	Settlement is considered as "urban"

Notes: Resident committee is the smallest territorial unit in China. Total population refers to long-stay population (registered population + migrants over six months).

Although the new statistical definition provides for a more precise calculation of urban residents at finer spatial/administrative scales, the underlying premise of the definition is still supply driven, e.g. based on public services available. Even if non-farming residents of suburban villages and towns have become part of urban labour and supply chains, they are not counted as urban if municipal services have not yet been extended to serve them. China's current supply-driven approach contrasts with the demand-driven approach followed in most OECD member countries where non-farming residents, most of whom are integrated into urban labour and housing markets and therefore have needs for urban-type public services, are generally counted as urban.

Source: Kamal-Chaoui, L., E. Leman and R. Zhang (2009), "Urban Trends and Policies in China", *OECD Regional Development Working Paper*, 2009/1, OECD Publishing, Paris; National Bureau of Statistics of China, *www.stats.gov.cn/tjbz/t20061018_402603208.htm*, in Chinese; OECD (2009), *OECD Rural Policy Review: China*, OECD Publishing, Paris.

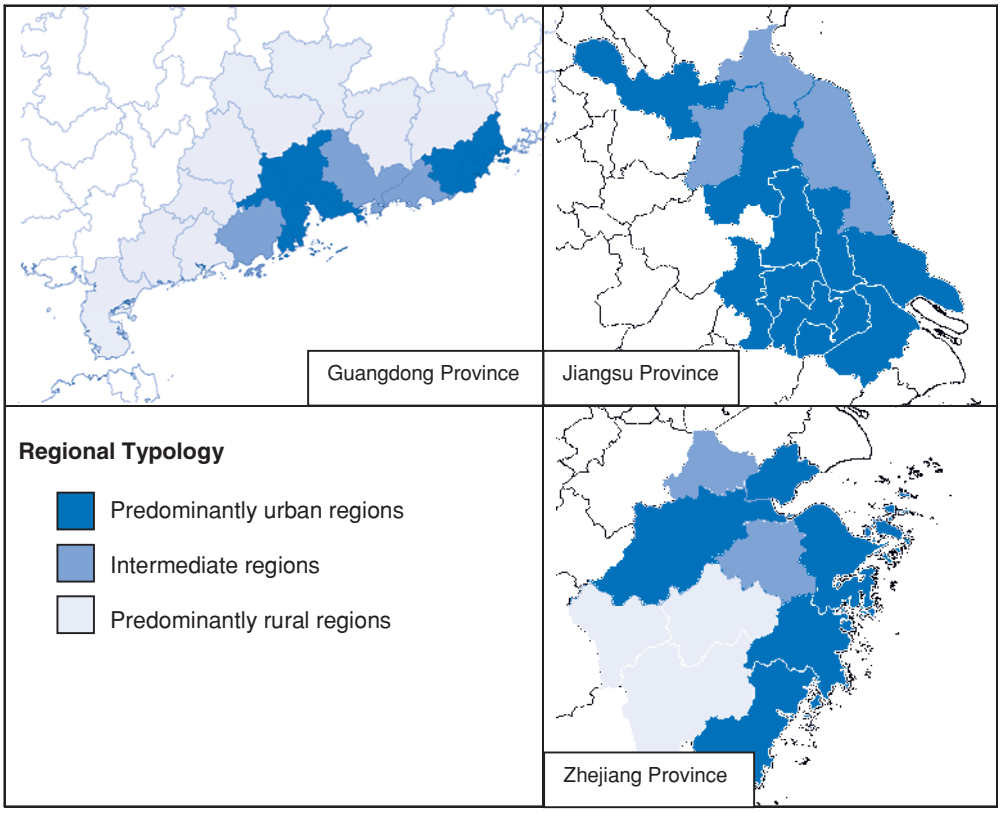
The rapid rate of urbanisation and industrialisation in parts of the province over the last two decades is probably unprecedented in human history. A large portion of these changes have occurred in rural towns – mostly in suburban areas of four metropolitan regions (Hong Kong, China/Shenzhen, Guangzhou/Foshan, Dongguan, and Shantou/Chaozhou/Jieyang) and not within the city proper. Urbanisation in China has

been driven mainly by two factors: *i*) rural-urban migration, of which around 45% comes from the same prefecture-level municipality (PLC), and 25% from other parts of the same province; and *ii*) most importantly, suburbanisation or town-based urbanisation, i.e. transformation of towns and villages into integral parts of urban economies in its original situation (Kamal-Chaoui *et al.*, 2009).[5] This second driving force has been more present in Guangdong than anywhere else in China since the mid-1980s.

In order to capture the exact trends of urbanisation in the Guangdong province, two approaches are adopted to analyse settlement structure: *i*) the first one is based on the OECD regional classification which has been applied to OECD member countries within the context of the work of the OECD Territorial Development Policy Committee; and *ii*) the second one is based on a functional definition of urban areas.

i) **Applying the OECD typology to Guangdong** shows that the province has a higher rate of people living in urban areas than the average for OECD member countries. For the purpose of international comparison, China would benefit from applying such a typology. The process constructs a rural and urban typology at the county/district level based on population density and at the sub-regional (PLC) level following the classification used by the OECD (Box 1.4). PLCs have been classified accordingly into predominantly rural (PR), intermediate (IN) and predominantly urban regions (PU). The method identifies nine PU regions (e.g. Guangzhou prefecture), nine PR regions (e.g. Qingyuan prefecture) and three IN regions (e.g. Huizhou prefecture). A similar process has also been applied to Zhejiang and Jiangsu provinces to facilitate the comparison (Figure 1.9). This analysis shows that at the prefecture level in 2005, over half of the total population lived in predominantly urban (PU) regions (51.2%), which accounted for 16.5% of the total landmass. Guangdong's PU concentration is higher than the OECD average (46%), including such countries as the United States, France, Korea and Mexico, but lower than the Netherlands, Belgium, the United Kingdom, Australia, Japan, Italy, and Canada. PR regions extended to over 69% of the provincial landmass and accounted for 37.3% of the total population, which is a percentage almost equivalent to the PR population share in the United States (37.2%), and higher than the OECD average (24.4%). This highlights the fact that the share of the total population living in intermediate regions (generally characterised by networks of small and medium-sized-cities), is very low – actually lower than all OECD member countries (Figure 1.10). This trend of a comparatively low share of medium-sized cities, which characterises China as a whole, is particularly acute in the case of the Guangdong province (OECD, 2010b).

Figure 1.9. **Applying the OECD Regional Classification in Guangdong, Zhejiang and Jiangsu provinces, China**



Source: Author's calculations based on data from the OECD *GIS database*, internal database and the methodology from OECD (2010), "Regional Typology", OECD, Paris.

ii) A second approach to assess urbanisation trends in the Guangdong province relies on **functional definitions**. While the OECD regional typology permits a meaningful international comparison, it is still based on administrative boundaries. Guangdong's dramatic industrialisation and urbanisation over the past 30 years has subverted the delineation of administrative boundaries (and hence, hierarchies of governance). Therefore another approach based on functional definitions is adopted to derive a more accurate estimate of: *ii/a)* functional "urban" zones, comparable to "cities" in OECD member countries; and *ii/b)* functional metropolitan regions. At a higher scale, the Greater Pearl River Delta could be considered as a *ii/c* functional urban system or urban cluster.

Box 1.4. **OECD regional classification in China**

To take into account the differences and establish meaningful comparisons among regions belonging to the same type and level, the OECD has established a definition of rural which is applied at the "local level". Then, a regional typology is used to classify regions as predominantly urban (PU), predominantly rural (PR) and intermediate (IN) using three steps.

The first step consists of classifying the lowest possible geographical level or "local units" (municipalities/counties) as rural or urban according to the "OECD rural definition". That is, depending on whether their population density is below or above 150 inhabitants per square kilometre (500 inhabitants for Japan and Korea, to account for the fact that their national population density exceeds 300 inhabitants per square kilometre. This higher threshold is also used for China). This step already provides a first definition of rural areas at the "local level".

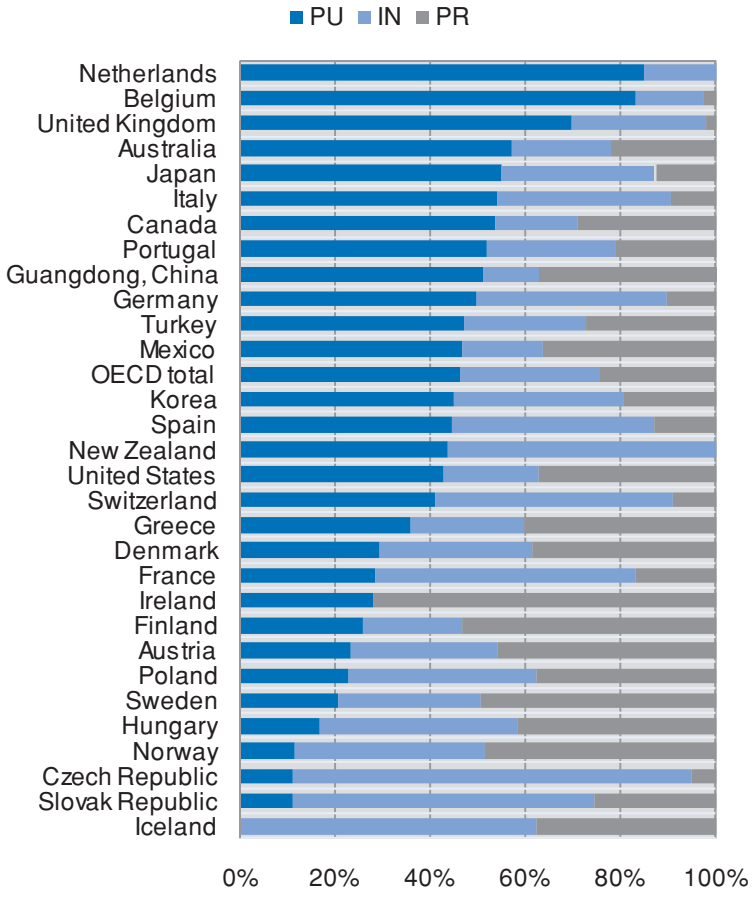
The second step involves aggregating this lower level into regions at the Territorial Level 3 (TL3), and classifying the latter according to the percentage of the population living in local units classified as rural, sometimes called "degree of rurality". TL3 corresponds in most countries to sub-regions and the prefecture-level in China. A TL3 is classified according to the share of population living in local units that is classified as rural. Predominantly urban (PU) is used when it is below 15%; intermediate (IN) if it is between 15% and 50%; predominantly rural (PR) if it is higher than 50%.

The third step is based on the size of the urban centres contained in the TL3 regions. This step adjusts the classification from steps 1 and 2 according to the size of urban centres and the percentage of total population that lives in those urban centres. A region that would be classified as predominantly rural (PR) on the basis of steps 1 and 2, becomes intermediate (IN) if it contains an urban centre of more than 200 000 inhabitants (500 000 for Japan and Korea) representing at least 25% of the regional population. It becomes predominantly urban (PU) if it contains an urban centre of more than 500 000 inhabitants (1 000 000 for Japan and Korea) representing at least 25% of the regional population. For China, a number of regions were reclassified during this step.

According to the OECD regional classification, Guangdong is one of China's Territorial Level 2 (TL2) regions (or provinces), and is divided into 21 TL3 regions, which represent the prefectures. A number of adaptations were made to the standard OECD methodology, not without possible controversy (OECD, 2009f). For example, for the first criterion, it might be argued that for China a threshold higher than 500 inhabitants per square kilometre could be used. However, this threshold, which is already used for Japan and Korea, was kept. It could also be argued that many rural areas in China have densities that in some other countries would be considered as urban, which are not easily identifiable under this methodology. The third step was not strictly applied since it would change many predominantly rural regions to urban. A last caveat from this exercise is related to the availability of information. While for the vast majority of counties and districts, information was available from the 2000 census, for a few of them a population estimate for 2005 or 2006 was used, assuming that the population density would not have varied enough over the period to change the local unit from urban to rural.

Source: OECD (2010), "Regional Typology", OECD, Paris; OECD (2009), *OECD Rural Policy Reviews: China*, OECD Publishing, Paris.

Figure 1.10. **Distribution of population across predominantly urban, intermediate and predominantly rural regions in OECD member countries and in Guangdong, 2005**



Source: OECD (2009), *Regions at a Glance*, OECD Publishing, Paris; *Guangdong Bureau of Statistics database*, *www.gdstats.gov.cn/tjnj/ml_e.htm*.

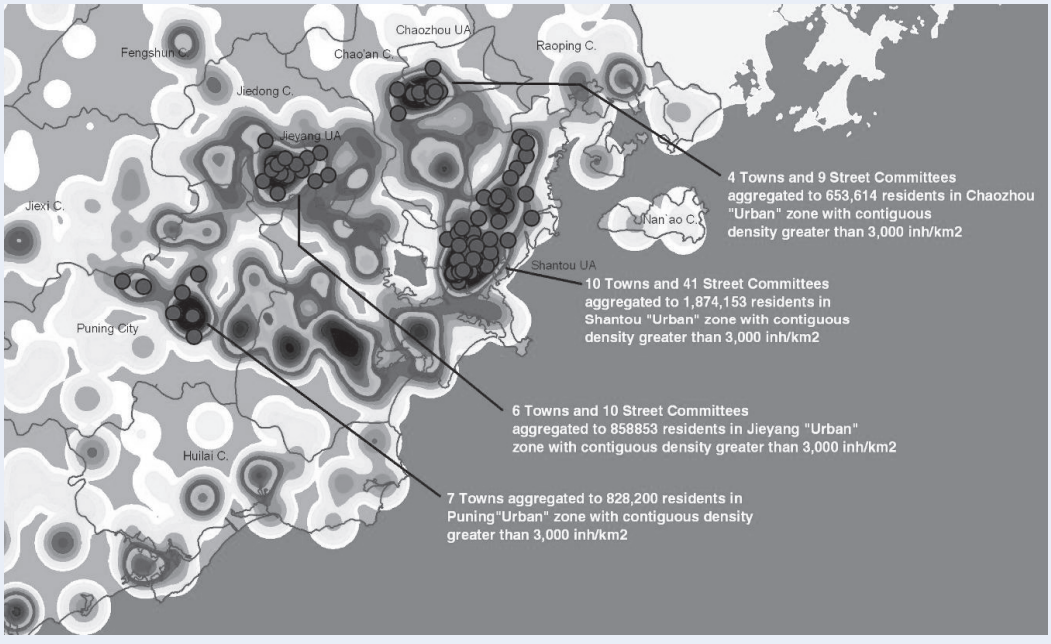
ii/a) Following a specific GIS-based methodology for aggregating towns, townships and street committees anchored in a statutory city with a population over 100 000 (Box 1.5), we can identify 145 **urban functional zones** in Guangdong province with 62 million people (Figure 1.11). These approximate the functional urban labour, input, and output markets in Guangdong and the two SARs. In comparative terms, Guangdong's urban market system (including 7.5 million in the two SARs) is twice the size of the urban population of Canada.

Box 1.5. **Urban functional zones**

To build urban functional zones, towns, townships, and street committees were overlaid with the population density data. Those that fell within zones of more than 3 000 inhabitants per square kilometre and were anchored in a statutory city were aggregated to define a functional urban zone around each city. Population data from 2007 for these small areas were added to define an urban population for cities. The results of this process are illustrated for the Shantou/Chaozhou/Jieyang cluster in the Eastern Region of Guangdong in the figure below. The resulting estimates of urban populations of statutory cities for Guangdong and Hong Kong, China/Macao, China are shown in Figure 1.11. To account for Guangdong's rapid and extensive town-based urbanisation, and possible lags in administrative re-designations of statutory towns into official cities, statutory towns with over 100 000 residents (in 2007) were also identified and plotted in the GIS (Figure 1.11). These "towns" would all be defined as "cities" in most OECD member countries. For example, 51 of the l00 largest cities in Canada had populations less than 100 000 in 2006. In Japan, a city has a minimum of 50 000 residents. There are 85 "towns" in Guangdong with over 100 000 residents, for a total of 15.6 million people. Three of them (Shajing Town in Shenzhen PLC, and Humen and Changan Towns in Dongguan PLC) have populations, including migrants, of over 500 000 residents.

Example of grouping of sub-municipal units to define "urban zones" of statutory cities

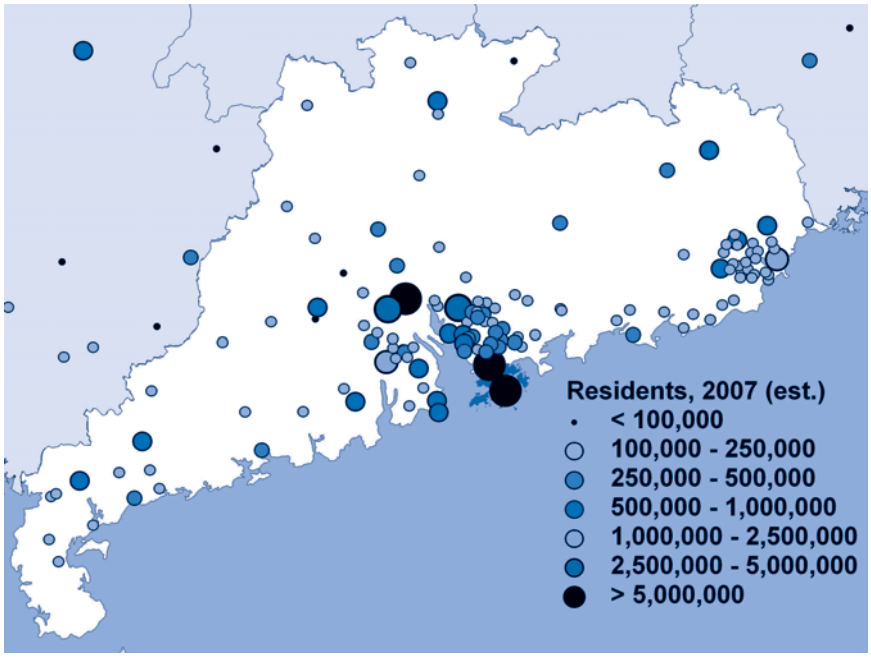
Shantou/Chaozhou/Jievand Cluster



Source: Calculations based on data from the OECD *GIS database,* internal database, using GIS interpolation of data from the 2000 National Census of China, *www.stats.gov.cn/tjsj/pcsj/rkpc/dwcrkpc*; and prefecture-level city data from population survey by the Guangdong Provincial Statistical Bureau, *www.gdstats.gov.cn/tjnj/ml_e.htm.*

Figure 1.11. **Estimated population of all urban settlements in Guangdong, Hong Kong, China and Macao, China, 2007**

Statutory towns and cities over 100 000



Source: Author's calculations based on data from the OECD *GIS database*, internal database, using GIS interpolation of data from the 2000 National Census of China, *www.stats.gov.cn/tjsj/pcsj/rkpc/dwcrkpc*; and prefecture-level city data from the population survey by the Guangdong Provincial Statistical Bureau, *www.gdstats.gov.cn/tjnj/ml_e.htm.*

ii/b) Based on analysis of this spatial pattern of population distribution and the specific **functional metropolitan region** definition for China (which is closest to that generally adopted in OECD member countries) there are four metropolitan regions in Guangdong and the SARs (Box 1.6). They include Guangzhou and Foshan which constitute one large metropolitan region, with a non-farming population over 10 million. Together called the Guangzhou (or GuangFo) metropolitan region, it contains the Guangzhou urban district, as well as Foshan's Nanhai, Chancheng and Shunde districts. Increasingly, Hong Kong, China and Shenzhen can also be viewed as a metropolitan region. Similarly, Shantou, Jieyang, and Chaozhou are a polycentric metropolitan region. Dongguan is the fourth metropolitan region in Guangdong.

Box 1.6. **Defining metropolitan regions**

Metropolitan regions are generally identified as large concentrations of population and economic activity that constitute functional economic areas, typically covering a number of local government authorities. An economic area in this sense denotes a geographical space within which a number of economic links are concentrated: most obviously labour markets, but also networks of firms, important parts of supply chains, and relations between firms and local authorities. The OECD has used a specific methodology to gather and analyse metropolitan data. The database is based on three criteria:

1. **Population size** – a threshold of 1.5 million people is used to identify a region as metropolitan.
2. **Population density** should exceed a critical value set at 150 people per square kilometre. These types of regions are considered predominantly urban; therefore, it is not only important to have a large population, but inhabitants must also be concentrated in a particular place thereby creating higher density rates.
3. **Labour market** – it is fundamental that these regions with large and dense populations constituting urban areas represent a contained labour market. In order to define labour markets, commuting flows are used to calculate net migration rates. Predominantly urban areas at Territorial Level 3 (equivalent to NUTS 3) have been selected and a process of adding and eliminating neighbouring regions based on net commuting rates has been carried out. Hence, metro-regions among predominantly urban areas (large and densely populated) are those for which the net commuting rate does not exceed 10% of the resident population.

Currently, data on commuting flows in metropolitan areas are not collected in China on a consistent, comparable basis. This means that the OECD definition cannot (yet) be applied.

In China, as in other countries, data limitations force the use of proxies to identify the majority of periodic social and economic interactions occurring in metropolitan regions within a reasonable travel time from the centre of China's cities. Research in other countries suggests that a one-hour travel time is generally the limit that households are willing to spend for most journeys to work and that most suppliers to enterprises can effectively travel for daily deliveries. Assuming motorised vehicles as the dominant mode of movement, this equates roughly to a maximum radius of 50 kilometres from the urban core when accounting for lower travel speeds in more congested central areas.

China's urban regions differ significantly from North American and European cases in the distribution of places of residence and places of work. Private vehicular ownership is low, regional commuter transit (such as in Tokyo, Paris and New York) does not yet exist, and distances to work are generally much smaller in China. This is partly due to the development of large, self-contained state-owned enterprise (SOE) complexes that include factories, residences, and public facilities in one location, and the township and village enterprise (TVE) industrialisation model in which places of work and residence are scattered in suburban towns. Therefore, in China more so than in Europe and North America, there is a much stronger correlation between population density and employment density, and hence with production. Constraints to physical mobility mean that the 50 kilometre radius is probably the maximum metropolitan catchment area in China. A one-hour drive time is possible by enterprises, most of which have access to motorised transport. But the majority of urban residents rely on inner-city public buses, bicycles and walking to get to work: their one-hour travel time distance is considerably shorter. While regulatory impediments were until recently the greatest constraints to labour mobility in urban markets, physical accessibility is emerging as the most significant impediment to labour flows within China's emerging metropolitan regions, particularly to and from suburban areas.

Box 1.6. **Defining metropolitan regions** (*continued*)

Given these conditions, the following approach has been used to identify and describe the spatial extent and structure of metropolitan regions in China:[1] i) identify, using GIS technology, areas that are anchored in the urban districts of statutory cities with more than 1 million non-farming residents; ii) identify where these cities appear to spill over by looking at non-farming populations and enterprises in towns and cities in adjacent counties and county-level cities that have: a) population densities over 500 inhabitants per square kilometre; b) non-farming GDP of more than 40% of total GDP; and c) good quality roads (either the National Trunk Highways System – NTHS – or national highway segments with road quality above Class 3); and iii) capture the core city and adjacent counties or CLCs generally within a 50 kilometre radius of the centre of the core city, representing a notional 1-hour travel time. Analysis of traffic volumes along the national highway network suggests that a few metropolitan regions likely spill over to capture selected counties beyond those immediately adjacent to the core city, e.g. that the reach of some is wider than 50 kilometres.

This method differs from the approach followed by the OECD to define metropolitan regions elsewhere. In terms of population thresholds, the OECD uses 1.5 million total residents, e.g. not differentiating between farming and non-farming populations. The OECD definition also uses a population density threshold of 150 inhabitants per square kilometre. China's suburban areas have very high densities – often well over 250 inhabitants per square kilometre – of farming populations on small landholdings in numerous scattered villages and towns. Applying these thresholds to China would essentially capture the majority of China's cities as metropolitan regions. However, the most significant constraint to applying the OECD method in China is the absence of accurate, comprehensive, current, and comparable data on commuting flows. These have not been collected in China since commuting from suburban areas is a very new phenomenon.

The proxy approach used here identifies 53 metropolitan regions in China anchored in cities with over 1 million non-farming residents and encompassing selected adjacent counties. They account for over 380 million people, or almost 30% of the country's population. The biggest metropolitan region in China is Shanghai with an urban population of over 17 million. In addition to Shanghai, Beijing and GuangFo (Guangzhou and Foshan) metropolitan regions have non-farming populations over 10 million. A second tier of 13 metropolitan regions has urban populations ranging from 5 million to 10 million. A third tier with populations ranging from 1 to 5 million comprises 37 regions. While first- and second-tier metropolitan regions are concentrated along the coast, many of China's medium and small size metropolitan regions are located inland.

Note: This method has been developed by Chreod.

Source: Kamal-Chaoui, L., E. Leman and R. Zhang (2009), "Urban Trends and Policies in China", *OECD Regional Development Working Paper*, 2009/1, OECD Publishing, Paris.

iii) Finally, the nine metropolitan cities plus Macao, China and Hong Kong, China which constitute the Greater Pearl River Delta represent an urban cluster or an urban system, often referred to as the PRD Metropolis. An urban system or urban cluster is understood as the geographical agglomeration of a close group of different sized cities that are well interconnected by communication and telecommunication infrastructure. Some examples of urban clusters can be found across OECD member countries. In Europe two urban systems are especially relevant, the Randstad and RhineRuhr. The Randstad region is a polycentric urban cluster in which the four largest cities of the Netherlands can be found (Amsterdam, Rotterdam, The Hague and Utrecht). The

RhineRuhr is another typical example of an urban system characterised by a dense agglomeration of numerous cities at the western edge of Germany along the Rhine (Bonn, Cologne, Düsseldorf, Krefeld and Mönchengladbach), in the east along the Ruhr (Bochum, Duisburg, Essen), north-east (Dortmund) and the Emscherzone in the north. In the United States the Tri-State region is one of the most populous urban systems in the world. This region includes the New York-Northern New Jersey-Long Island, New York-New Jersey-Pennsylvania metropolitan statistical area (MSA).

A migration hub

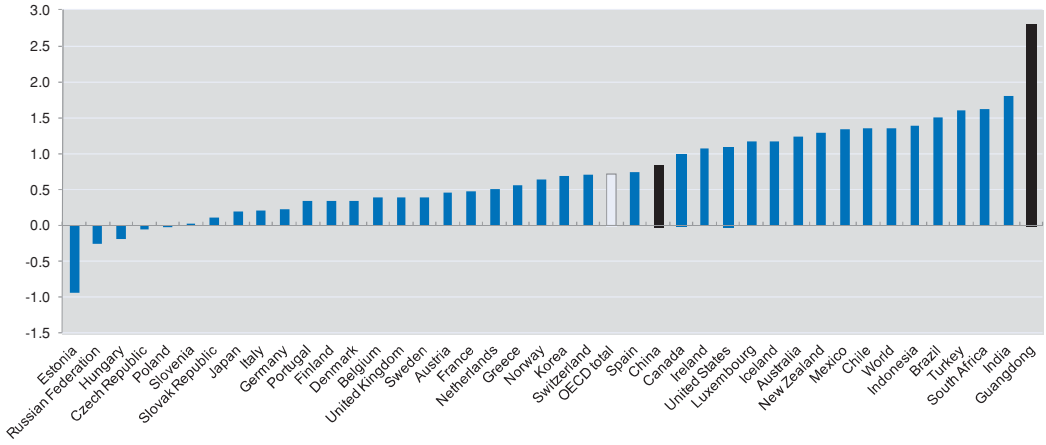
Guangdong's population profile has been heavily influenced by migrants, including those from within Guangdong and other provinces. Provincial governments estimate that there are 27 million rural migrant workers, of which 8 million are from internal migration and 19 million from other provinces (GDPG, 2009b). For both groups, the urbanised PRD region of Guangdong is the main destination thanks to the region's economic expansion, massive job creation in the cities and higher per capita income. Push factors for rural migrants in China include very low income per capita, abundant supply of labour force released from the agricultural sector, and scarce non-agricultural job opportunities as well as low availability of cultivated land, environmental degradation, and natural disasters (OECD, 2009f). In Guangdong, the inflow of rural migrant workers from other provinces is the main reason for the high annual population growth rate of 2.8% from 1990-2008, which is more than three times China's national average for the same period and four times that of the OECD average (Figure 1.12). Since the natural population growth rate over the period is 0.97% in relation to a similar rate of 0.88% for China, Guangdong's high population growth rate is largely captured by the growing difference between the permanent population (census-based) and the registered population (*hukou*-based), which grew from almost 0 in the early 1990s to approximately 13 million in 2008 (Figure 1.13 and Box 1.7).[6]

Box 1.7. **The *hukou* system and migration in China**

The registered population (hukou-based) is defined as the population officially registered with the police bureau. The permanent population (census-based) is defined as the population which has resided in a city for more than six months and figures are obtained from a general survey. Regulations were promulgated in 1958 that strictly limited rural-to-urban migration. According to these regulations, all Chinese citizens are assigned an agricultural or non-agricultural residency designation at birth, based on that held by their parents. This residency registration (hukou) is essentially permanent. Originally, residents with non-agricultural hukou were granted ration cards for a wide range of basic foodstuffs and commodities, and were entitled to employment in cities, largely with state-owned enterprises (SOEs) or government agencies that provided full housing, health care, and education services. Under this two-tier management system, agricultural-registered residents were not entitled to "urban" benefits as they were assumed to be agricultural workers, and hence entitled to farm collectively-owned land as the basis of their livelihoods. While the original rationing entitlements have by now largely disappeared as most commodities and services have been marketised over the last 25 years (including, most recently, housing), hukou is still used to preclude access by agricultural-registered citizens to subsidised health care, unemployment insurance, guaranteed minimum incomes and basic welfare support which are only available in cities.

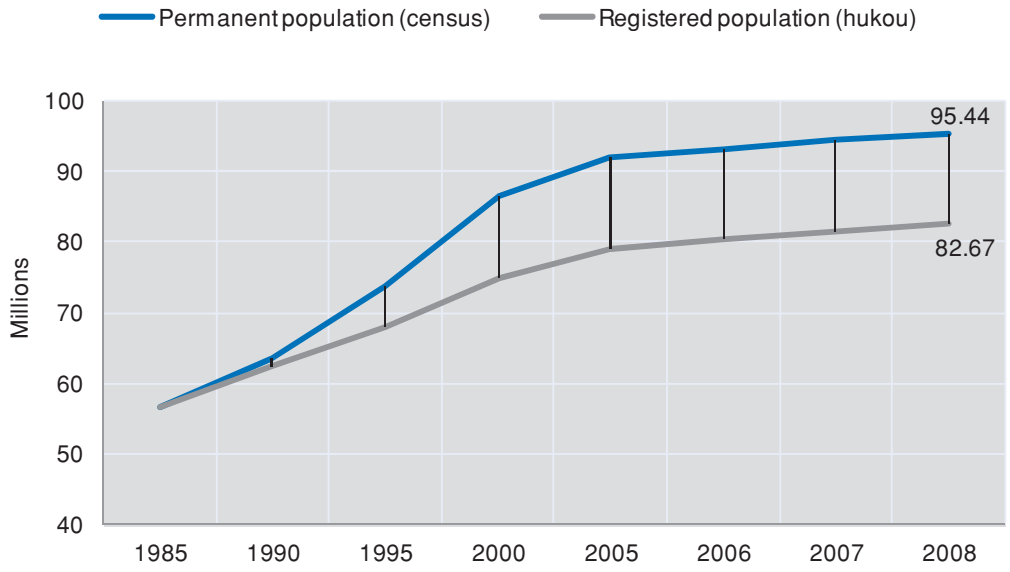
Source: Kamal-Chaoui, L., E. Leman and R. Zhang (2009), "Urban Trends and Policies in China", *OECD Regional Development Working Paper*, 2009/1, OECD Publishing, Paris.

Figure 1.12. **Average annual population growth in Guangdong and selected countries, 1998-2008**



Source: OECD (2009), *OECD Factbook 2009*, OECD Publishing, Paris; *National Bureau of Statistics of China database*, *www.stats.gov.cn/english/statisticaldata/yearlydata.*

Figure 1.13. **Population trends in Guangdong, 1985-2008**



Note: The comparison between the permanent population (census-based) and the registered population (*hukou*-based) reflects net migrant inflow from other provinces.

Source: *Guangdong Bureau of Statistics database*, *www.gdstats.gov.cn/tjnj/ml_e.htm.*

Recent trends show, however, that Guangdong is losing its attractiveness for migrants to the benefit of other Chinese provinces. Considering the relatively higher educational level of migrants coming to Guangdong from other provinces, a recent worrisome trend is that migrant workers, a valuable labour resource, are less attracted to Guangdong, and are starting to prefer the Yangtze River Delta (YRD). The severe problem is masked by the continuing population inflow and the labour shortage of migrant workers in many provinces, including Guangdong, Zhejiang and Jiangsu. In fact, Guangdong's average net population inflow rate has been around 0.5% since 2000, down from over 2% in the 1990s. On the contrary, Zhejiang and Jiangsu have witnessed a higher average rate since 2000, compared to their rate of 10 years ago (Table 1.2). A close examination reveals that since 2004, both Zhejiang and Jiangsu have started to overtake Guangdong in attracting incoming population, of which a large percentage is assumed to be migrant workers (Figure 1.14). A highly probable explanation is that rural migrant labour has started to move from the PRD region to the YRD region (Wang *et al.*, 2006; Study Group of the Ministry of Labour and Social Security, 2004). In 2007, Guangdong's net population inflow picked up, probably as a result of increasing minimum wage in the PRD by the provincial government in late 2006.[7] However, net inflow is still lower than the sum of both Zhejiang and Jiangsu. In 2008, the net population inflow decreased again. The highly possible long-term trend of losing this valuable labour resource is particularly worrisome for Guangdong as it strives to maintain its position as an advanced manufacturing base. Moreover, although the migrant labour shortage phenomenon occurred nationwide, the outflow of labour from PRD to YRD has placed further pressures and aggravated the labour shortage problem in Guangdong. By comparison, factories in the YRD offer higher salaries, a better working environment, and job stability (Wang *et al.*, 2005; Study Group of the Ministry of Labour and Social Security, 2004).

Table 1.2. **Rates of total population growth, natural population growth and net population inflow**

A comparison between Guangdong, Zhejiang and Jiangsu, in %

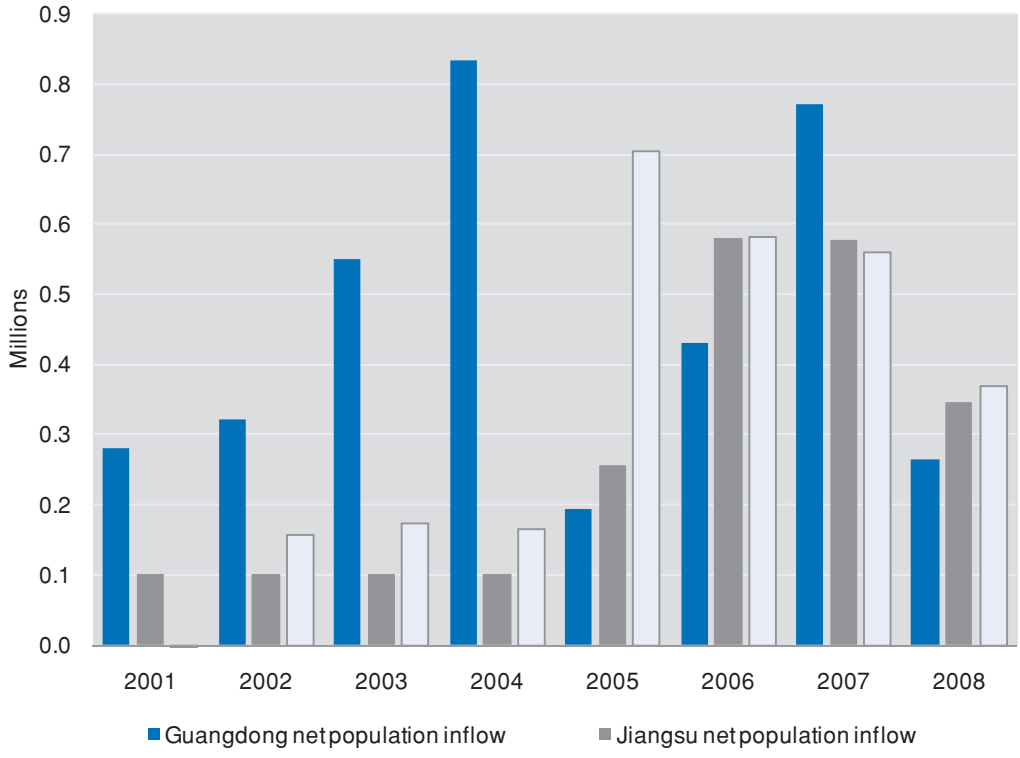
	1990-1995	1995-2000	2000-2005	2005-2008
Total population growth				
China	1.19	0.93	0.63	0.52
Guangdong	3.28	3.42	1.26	1.27
Jiangsu	0.88	0.74	0.40	0.90
Zhejiang	0.71	1.33	0.93	1.51
Natural population growth[1]				
China	1.16	0.91	0.62	0.52
Guangdong	1.25	0.93	0.74	0.73
Jiangsu	0.79	0.41	0.22	0.23
Zhejiang	0.72	0.47	0.42	0.48
Net population inflow[2]				
China	0.03	0.02	0.01	0.00
Guangdong	2.02	2.49	0.52	0.54
Jiangsu	0.09	0.33	0.18	0.67
Zhejiang	0.00	0.85	0.52	1.04

Note 1: Natural growth rate refers to the ratio of natural increase in population (number of births minus number of deaths) during a certain period of time (usually one year) to the average population of the same period.

Note 2: Net population inflow = total population growth – natural population growth.

Source: National Bureau of Statistics of China database, *www.stats.gov.cn/english/statisticaldata/yearlydata*; *CEIC database*, *www.ceicdata.com.*

Figure 1.14. **Comparison of net population inflow in Guangdong, Zhejiang and Jiangsu provinces, 2001-2008**



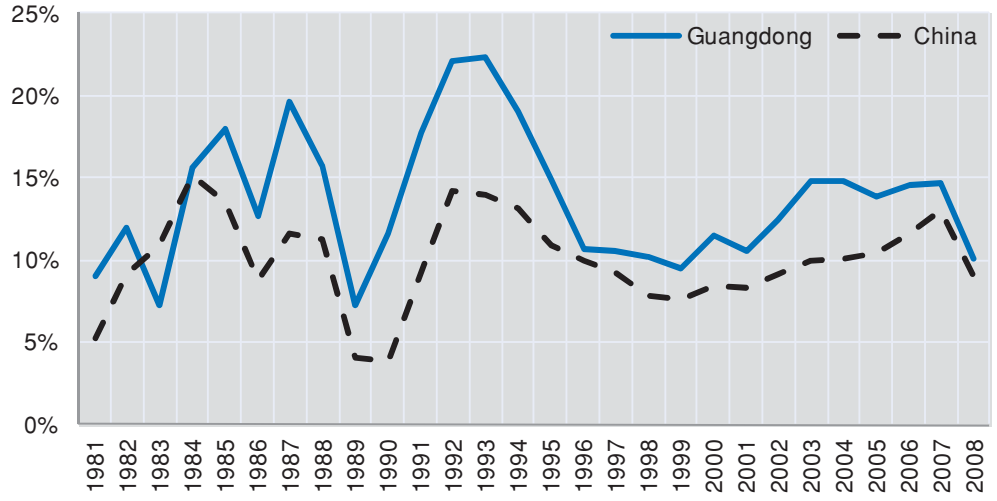
Source: National Bureau of Statistics of China database, *www.stats.gov.cn/english/statisticaldata/yearlydata*; *CEIC database*, *www.ceicdata.com.*

1.2. Guangdong's emergence as a global economic region

The largest economy in China

Guangdong province is the largest economy in China and has been a principal driver of the national economy over the last 30 years. In 2008, the province featured a GDP of CNY 3 569 billion (USD 938.3 billion, PPP), making it the largest economy in China, representing 12% of the country's GDP, up from 10.2% in 1998 (Figure 1.16). The province also registered one of the highest output growth rates in the nation, with an annual average of 13.7% over 1981-2008, in relation to the national level of 10% over the same period (Figure 1.15). It stands among the richest provinces in China with a GDP per capita at CNY 37 589 (USD 9 873, PPP) in 2008. Guangdong's 2008 GDP per capita represents 166% of the national average, up from 159% in 1998. While Guangdong's GDP per capita exceeded that of Jiangsu in 1998, the relative positions were reversed by 2008 (Figure 1.17). On an international scale, the size of the Guangdong economy is almost equivalent to that of Australia and Turkey (Figure 1.18). Like the rest of China, its GDP per capita is lower than all OECD member countries, although not very far below that of Turkey (Figure 1.19).

Figure 1.15. **Annual GDP growth rate of Guangdong and China, 1981-2008**

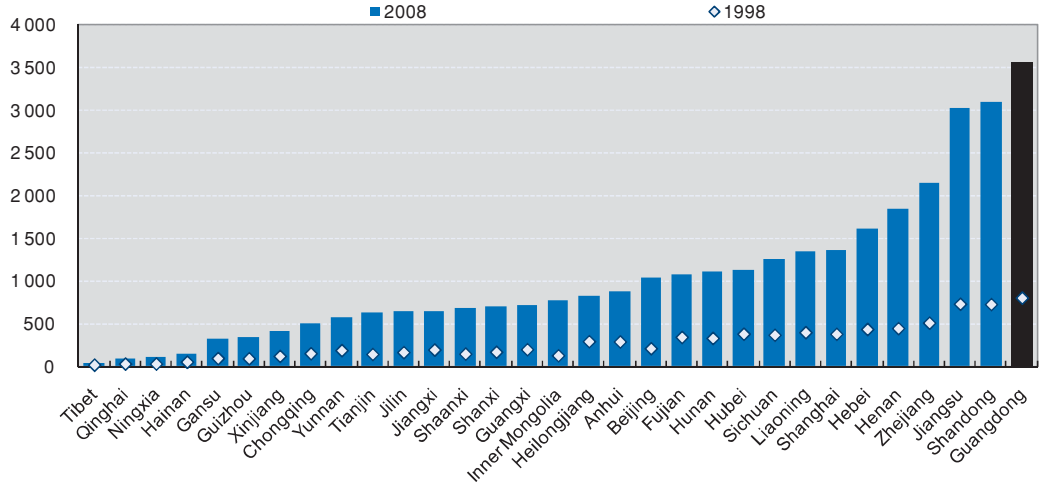


Note: The data are calculated at comparable prices.

Source: National Bureau of Statistics of China database, *www.stats.gov.cn/english/statisticaldata/yearlydata*; *CEIC database*, *www.ceicdata.com*.

Figure 1.16. **GDP of Chinese provinces, 2008 and 1998 (CNY)**

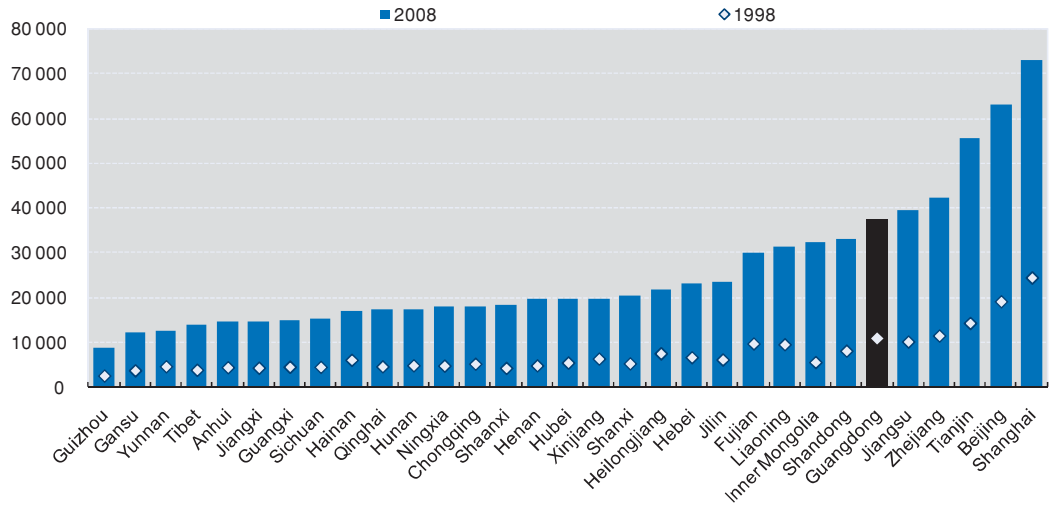
Billion CNY, 1998 and 2008 current prices



Source: National Bureau of Statistics of China database, *www.stats.gov.cn/english/statisticaldata/yearlydata*; *CEIC database*, *www.ceicdata.com.*

Figure 1.17. **GDP per capita of Chinese provinces**

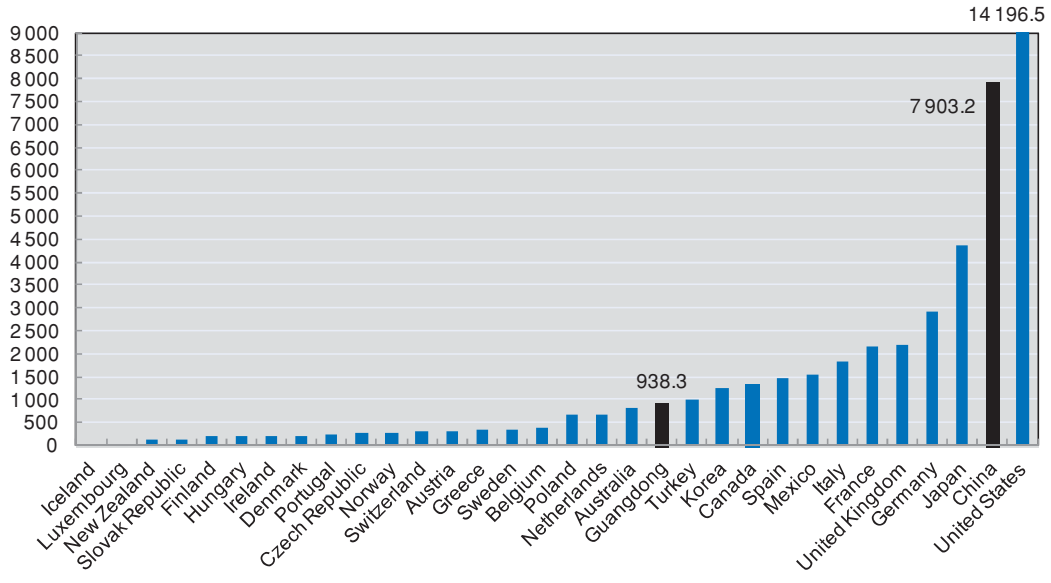
CNY, 1998 and 2008 current prices



Source: National Bureau of Statistics of China database, *www.stats.gov.cn/english/statisticaldata/yearlydata*; *CEIC database*, *www.ceicdata.com*.

Figure 1.18. **GDP international comparison: Guangdong, China and OECD member countries**

Billions USD, current prices and PPPs, 2008

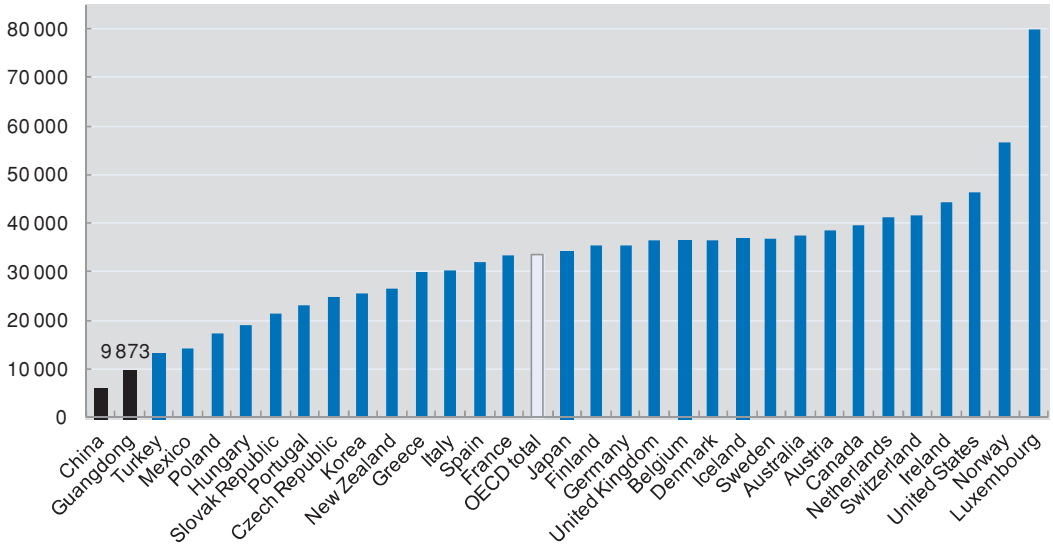


Note: China GDP PPP data are from the World Bank, 2008; Guangdong GDP PPP uses the same conversion rate as China.

Source: OECD (2009), *National Accounts of OECD Countries*, OECD Publishing, Paris; *World Development Indicators database*, *http://data.worldbank.org*.

Figure 1.19. **GDP per capita in OECD member countries, China and Guangdong province**

USD, current prices and PPPs, 2008

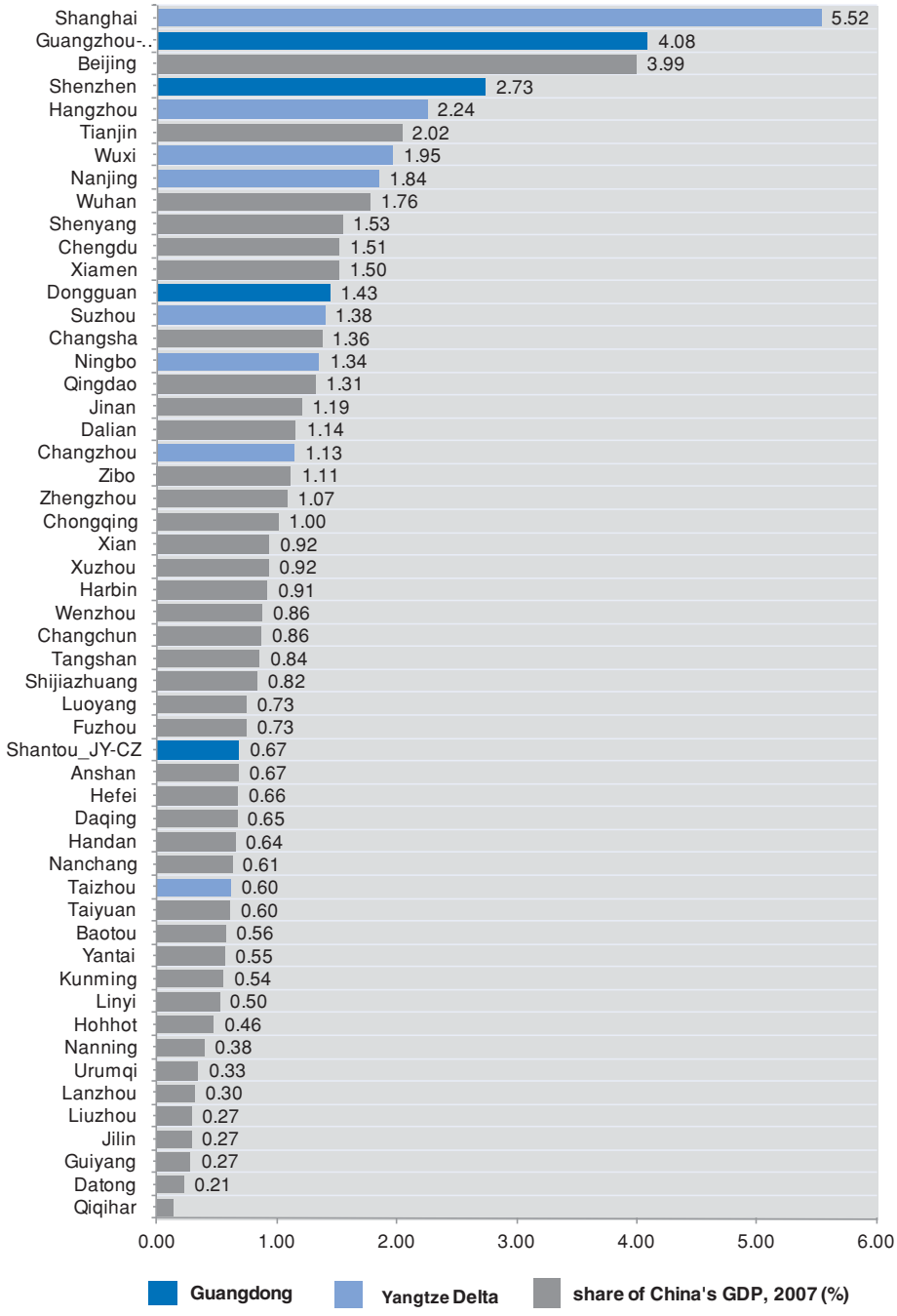


Note: China GDP per capita PPP data are from the World Bank, 2008; Guangdong GDP per capita PPP uses the same conversion rate as China.

Source: OECD (2009), *National Accounts of OECD Countries*, OECD Publishing, Paris; *World Development Indicators* (database), *http://data.worldbank.org*.

The Pearl River Delta has been the main economic driver of the province. In 2008 the GDP of the PRD region was CNY 2 974.6 billion (USD 781.9 billion, PPP), representing 79.4% of the provincial GDP. The other 20.6% is generated by 3 non-PRD regions (Western Guangdong, Northern Guangdong and Eastern Guangdong). The PRD alone accounts for 9.9% of China's national GDP,[8] with the 3 metropolitan regions (GuangFo, Shenzhen and Dongguan) together representing 8% of the Chinese economy. Among the 53 largest Chinese metropolitan regions, GuangFo, Shenzhen and Dongguan rank 2nd, 4th and 13th respectively in terms of their share in China's total output (Figure 1.20).

Figure 1.20. **Share of China's GDP for the 53 largest metropolitan regions, 2007**



Source: Kamal-Chaoui, L., E. Leman and R. Zhang (2009), "Urban Trends and Policies in China", *OECD Regional Development Working Paper*, 2009/1, OECD Publishing, Paris.

Since the inception of the "Reform and Open-up" policy in 1978, Guangdong has transformed itself from a backward agricultural economy to an industrial-based economy. Over 2005-2008, Guangdong's GDP was generated as follows: 51.4% from the secondary sector (including 48.0% from industry and 3.4% from construction), 43.0% from the tertiary sector and 5.6% from the primary sector.[9] Industry, therefore, accounted for the main part of the provincial GDP in 2005-2008, up from 33.8% in 1981-1985. Between 1981 and 2008 the average annual growth rate of industry was 17.9%, higher than both the primary and secondary sectors. Meanwhile, the tertiary sector increased its share from 27.0% in 1981-1985 to 43.0% in 2005-2008 although the average growth rate for this sector has slowed from 15% in the 1980s and 1990s to 12.3% since 2000. The contribution of the primary sector decreased from 32.3% of the provincial GDP in 1981-1985 to 5.6% in 2005-2008 (Table 1.3). The dominance of the industrial sector in Guangdong is similar to that of several other coastal provinces – Zhejiang, Jiangsu and Shandong – which also have economies with larger industrial sectors and smaller primary sectors than the national average.

Table 1.3. **GDP sectoral breakdown, 1981-2008**

Comparison between China and Guangdong, Jiangsu and Zhejiang provinces

	1981-1985	1986-1990	1991-1995	1996-2000	2001-2005	2005-2008
Primary sector						
China	31.8%	26.4%	21.2%	17.4%	13.3%	11.3%
Guangdong	32.3%	26.5%	17.3%	11.6%	7.1%	5.6%
Jiangsu	33.0%	26.6%	17.9%	14.1%	9.5%	7.0%
Zhejiang	32.8%	25.9%	18.2%	12.7%	8.0%	5.4%
Shandong	38.1%	30.4%	23.0%	17.2%	12.6%	9.7%
Secondary sector: industry						
China	39.9%	38.0%	39.4%	40.7%	40.5%	43.0%
Guangdong	33.8%	32.8%	38.8%	41.6%	43.5%	48.0%
Jiangsu	44.8%	45.4%	47.7%	44.8%	48.3%	50.5%
Zhejiang	40.0%	41.1%	44.3%	48.2%	45.7%	48.3%
Shandong	37.3%	38.3%	41.3%	42.9%	48.3%	51.9%
Secondary sector: construction						
China	4.4%	5.1%	5.7%	5.9%	5.5%	5.6%
Guangdong	6.9%	6.5%	7.8%	5.9%	4.3%	3.4%
Jiangsu	4.6%	4.8%	6.1%	6.3%	6.4%	5.2%
Zhejiang	4.6%	5.0%	5.5%	5.3%	5.5%	5.7%
Shandong	4.7%	5.0%	5.1%	5.6%	6.2%	5.3%
Tertiary sector						
China	24.0%	30.6%	33.7%	36.0%	40.7%	40.1%
Guangdong	27.0%	34.2%	36.0%	40.9%	45.1%	43.0%
Jiangsu	17.7%	23.2%	26.6%	34.9%	36.5%	37.2%
Zhejiang	22.6%	28.1%	28.1%	33.4%	38.5%	40.6%
Shandong	19.9%	26.3%	26.3%	34.7%	35.1%	33.1%

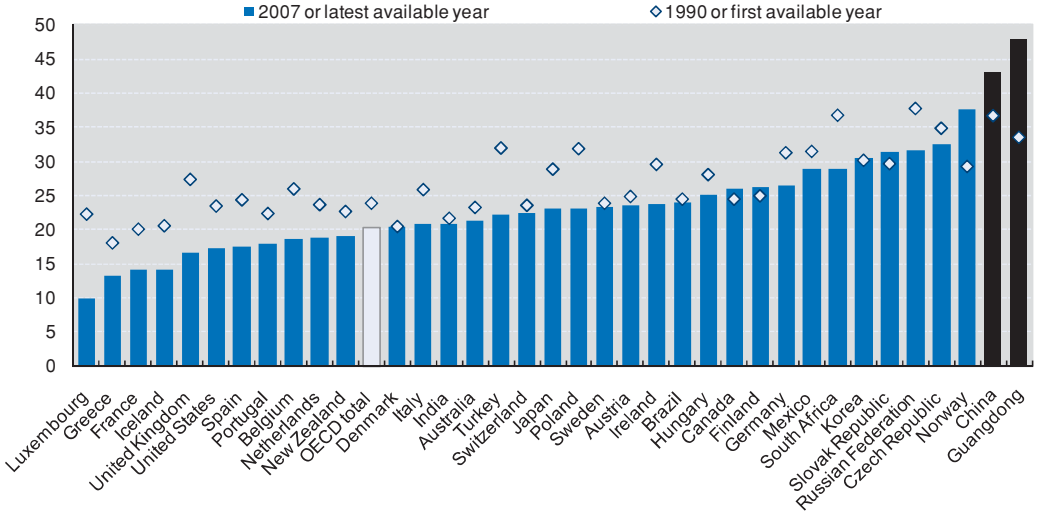
Source: National Bureau of Statistics of China database, *www.stats.gov.cn/english/statisticaldata/yearlydata*; *CEIC database*, *www.ceicdata.com*.

The share of industry in Guangdong's economy differs markedly from most industrialised OECD member countries. Value added from industry as a percentage of GDP is 48% in Guangdong, yet the rate is 20.2% in OECD member countries (Figure 1.21). This is because Guangdong's economy is at a different stage of economic development and structural change. For instance, the significant growth in Guangdong's manufacturing sector over the last 20 years of industrialisation significantly contributed to growth in total value added from industry (Yang *et al.*, 2008). While during the same period, many developed OECD member countries have entered the knowledge economy

and experienced a decline in the share of value added from industry, with a concurrent rise in the share of services. In most OECD member countries, this process has been driven by rapid changes in productivity change of the manufacturing sector and a demand shift to services (OECD, 2007a).

Figure 1.21. **Value added in industry**

As % of total value added



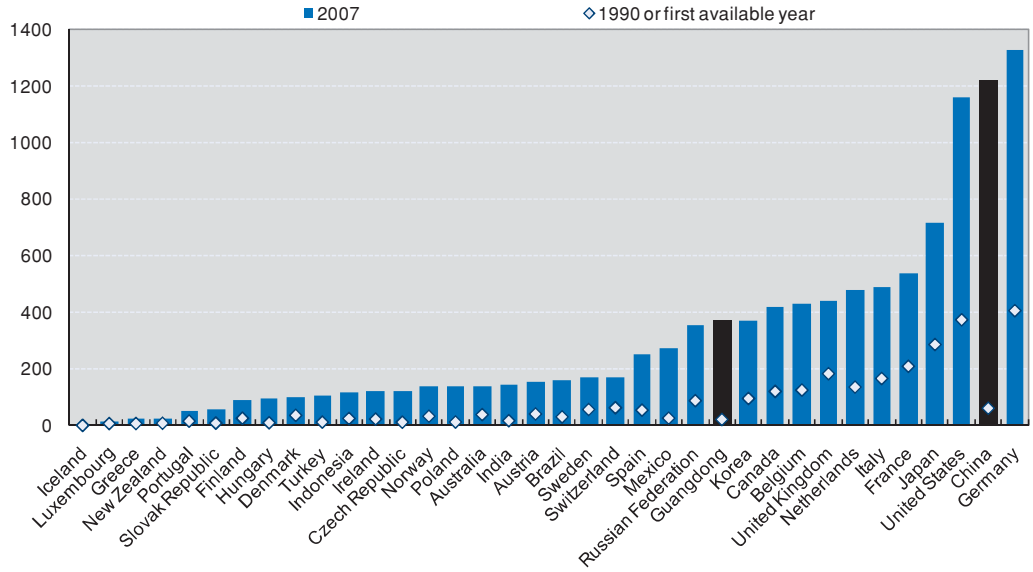
Notes: Exceptions in first available year data are: Hungary, 1991; Poland, 1992; Slovak Republic, 1993; OECD total, 1995; India, 1997. Exceptions in latest available year data are: Canada, 2004; Iceland, 2005; Japan, 2006; Mexico, 2006; New Zealand, 2003; United States, 2006; OECD total, 2003; Brazil, 2006.

Source: OECD (2009), *OECD Factbook 2009*, OECD Publishing, Paris; *National Bureau of Statistics of China database*, *www.stats.gov.cn/english/statisticaldata/yearlydata*; *CEIC database*, *www.ceicdata.com*.

Guangdong's economic growth has been characterised by a high trade to GDP ratio, thanks to its participation in the pilot round of China's "Reform and Open-up" policy. A key development feature of this model has been "processing trade", which allows companies to benefit from importing, assembling, and exporting via Hong Kong, China. This allowed Guangdong to become the largest exporting province in China, accounting for 28.3% of China's total exports in 2008 (whilst Guangdong represents 7.1% of the country's population) (*NBS China database*). However, the average portion of Chinese exports coming from Guangdong declined from 39% in 1990-1999 to 33% in 2000-2008, mostly due to progress in other coastal provinces such as Zhejiang and Jiangsu (*NBS China database*). China surpassed the United States and became the second largest exporting nation after Germany when its share of the global goods market reached 8.73% in 2007, up from less than 1% in 1979 (World Trade Organisation – WTO, 2008). Guangdong played a role in that progress, as the province itself accounts for 2.64% of the 2007 total world exports of goods (Figure 1.22). In 2008, Guangdong's exports amounted to USD 404.1 billion, e.g. larger than that of the Russian Federation.

Figure 1.22. **Export of goods**

Billions USD



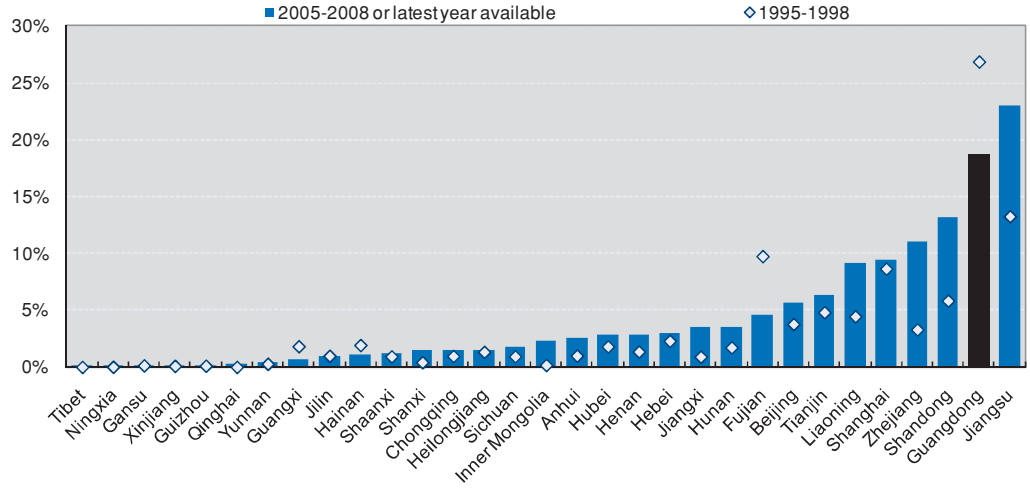
Notes: The data are calculated at year 1990 or first available year and 2007 current prices. Exceptions in first year data are: Belgium and the Czech Republic, 1993; Hungary and Poland, 1992; Korea, 1994; Luxemburg, 1999; Slovak Republic and India, 1997; Russian Federation, 1996.

Source: OECD (2009), *OECD Factbook 2009*, OECD Publishing, Paris; *National Bureau of Statistics of China database*, *www.stats.gov.cn/english/statisticaldata/yearlydata*; *CEIC database*, *www.ceicdata.com*.

As a provincial economy open to trade, Guangdong is one of the main receivers for China's incoming foreign direct investment (FDI). In accumulative terms, Guangdong obtained roughly 25% China's total FDI over 1978-2008. The provincial incoming FDI was USD 19.2 billion in 2008, up from USD 12 billion in 1998 (*NBS China database*). Yet Guangdong's portion of China's utilised FDI declined from 26.8% in 1995-1998 to 18.8% in 2005-2008 (Figure 1.23), largely due to the surge in other coastal provinces, e.g. Jiangsu, Shandong. Internationally, the average inflow of FDI in Guangdong reached USD 15 792 million in 2005-2008, similar to that of Poland and Turkey (Figure 1.24).

Figure 1.23. **Inflows of foreign direct investment to Chinese provinces**

As % of national total

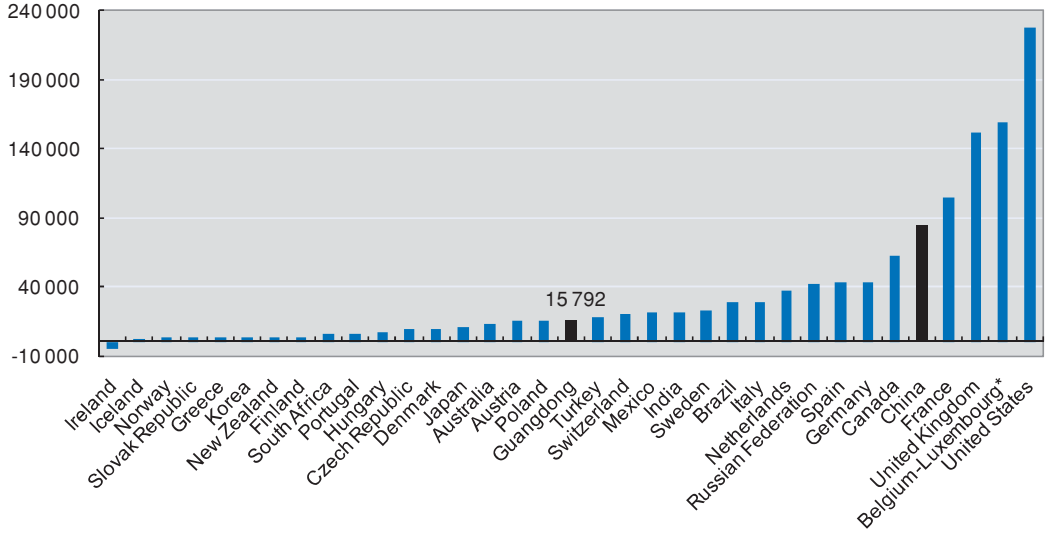


Note: Tianjin, Shanghai, Shandong, Yunnan, Sichuan show 2005-2007 data.

Source: CEIC database, *www.ceicdata.com*, adopted from Chinese Ministry of Commerce.

Figure 1.24. **Inflows of foreign direct investment, international comparison**

Millions USD, average 2005-2008



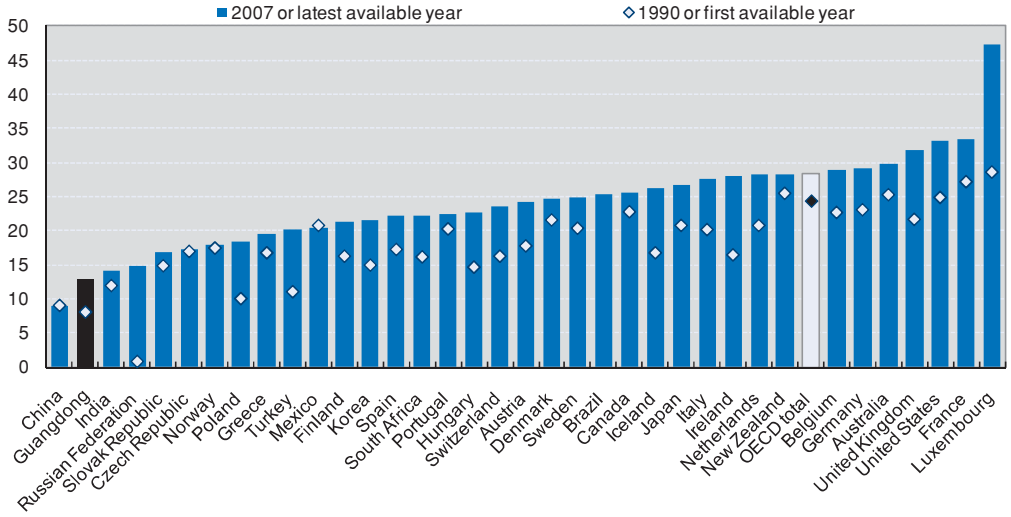
Note: Including Belgium and Luxembourg for flows only.

Source: OECD International Direct Investment (database); *CEIC database*, *www.ceicdata.com*, adopted from Chinese Ministry of Commerce.

Structural changes in Guangdong's economy could unleash the potential of its tertiary sector. Although it has the highest share of tertiary sector activity among Chinese provinces (excluding municipalities like Beijing, Shanghai and Tianjin), it is still low compared with OECD member countries. Guangdong's share of value added from banks, insurance, real estate and other business services reached 13% in 2007, up from 8% in 1990, while the figure in OECD member countries grew from 24.3% in 1990 to 28.4% in 2007 (Figure 1.25). Contribution to value added from traditional tertiary sectors – transport, trade, hotels and restaurants in Guangdong declined from 16.3% in 1990 to 13.1% in 2007, both of which present much lower figures than the average in OECD member countries (Figure 1.26). The proportional decline in more traditional tertiary sector activities is a consequence of the decreasing share of the transport, storage and posts services sectors, partly because market share of transport activities has been taken by the Yangtze River Delta region (Table 1.4).

Figure 1.25. **Value added from banks, insurance, real estate and other business services**

As % of total value added

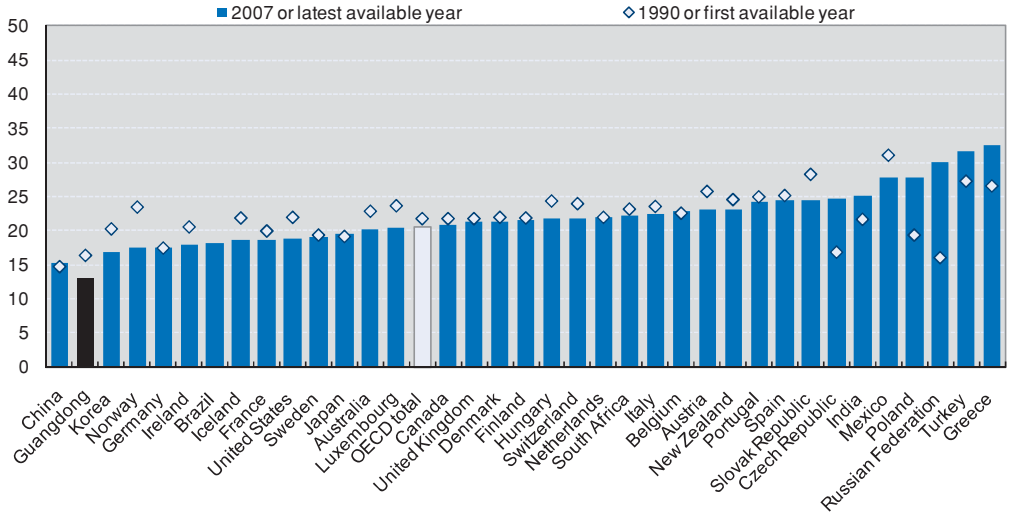


Notes: Exceptions in first available year data are: Hungary, 1991; Poland, 1992; Slovak Republic, 1994; OECD total, 1995; Brazil, no first year data; India, 1997; South Africa, 1993. Exceptions in latest available year data are: Canada, 2004; Iceland, 2005; Japan, 2006; Mexico, 2006; New Zealand, 2003; United States, 2006; OECD total, 2003; Brazil, 2006.

Source: OECD (2009), *OECD Factbook 2009*, OECD Publishing, Paris; *National Bureau of Statistics of China database*, *www.stats.gov.cn/english/statisticaldata/yearlydata*; *CEIC database*, *www.ceicdata.com*.

Figure 1.26. **Value added from transport, trade, hotels and restaurants**

As % of total value added



Notes: Exceptions in first available year data are: Hungary, 1991; Poland, 1992; Slovak Republic, 1994; OECD total, 1995; Brazil, no first year data; India, 1997; South Africa, 1993. Exceptions in latest available year data are: Canada, 2004; Iceland, 2005; Japan, 2006; Mexico, 2006; New Zealand, 2003; United States, 2006; OECD total, 2003; Brazil, 2006.

Source: OECD (2009), *OECD Factbook 2009*, OECD Publishing, Paris; *National Bureau of Statistics of China database*, *www.stats.gov.cn/english/statisticaldata/yearlydata*; *CEIC database*, *www.ceicdata.com*.

Table 1.4. **Guangdong's tertiary sector breakdown, 1991-2008**

	1991-1995	1996-2000	2001-2005	2006-2008
Tertiary sector	36.0%	40.9%	45.1%	43.0%
Transport, storage and posts	7.2%	8.2%	7.6%	4.1%
Wholesale, retail and catering	10.1%	12.4%	12.2%	9.4%
Banking and insurance	4.5%	3.8%	3.3%	5.1%
Real estate	3.5%	5.0%	6.0%	6.6%
Other	10.8%	11.6%	16.0%	17.8%

Source: CEIC database, *www.ceicdata.com*, adopted from National Bureau of Statistics of China.

Financial service is one source of potential growth in the tertiary sector. The province's financial industry is concentrated in Guangzhou and Shenzhen. The latter, in particular, enjoys more liberalised policies in terms of economic development as a special economic zone (SEZ) in China and has become the financial centre in South China, equivalent to Shanghai in the north. The Shenzhen Stock Exchange and the China Merchants Bank are the two important elements of financial business in Shenzhen (Box 1.8). The financial services sector requires highly skilled human capital. A key element is how Guangdong could pursue a brain-gain strategy to support the growth of the financial sector.

Box 1.8. Two important elements of financial business in Shenzhen

The Shenzhen Stock Exchange (SZSE)

The Shenzhen Stock Exchange (SZSE) is a "mutualised" national stock exchange under the China Securities Regulatory Commission. A broad spectrum of market participants, including 540 listed companies, 35 million registered investors and 177 exchange members, make up the market.

Established in 1990, the SZSE was the first stock exchange created in China. Over the last three decades, it has successfully developed into a nationwide securities trading market, with a market capitalisation around CNY 1 trillion (USD 122 billion). The daily trading volume is around 600 000 deals, valued at USD 807 million. The accumulated volume of capitalisation in the SZSE exceeds CNY 400 billion.

The SZSE contributes substantially to the rapid development of China's market economy, especially in the Pan Pearl River Area. A stock index of meaningful influence is a symbol of a mature securities market. Three indices have been created by the SZSE: the SZSE Component Index, the SZSE Composition Index and the SZSE SME Price Index. As equivalents and comparative indicators to Shanghai Stock Exchange indices, the SZSE indices are exerting a more and more significant influence over China's capital markets. Together with Shanghai Stock Exchange indices, the SZSE indices help to give investors a better understanding and a more exact picture of China's securities market and economy.

Profound changes are happening in China's capital market, especially in terms of the securities market. The national government's commitment to develop the securities market was demonstrated in the implementation of some key pieces of legislation. For example, the Security Law (1998, revised in 2005). The latter regulates security issuance and trading, and guarantees the legal status of the capital market. The capital market benefits from the involvement of the Small and Medium Enterprises (SME) Board. Created in 2004, the SME board supports the growth of small businesses and a multi-tier market. This board helps small and medium businesses access capital more easily. "[It] is designed for small- and mid-caps with pronounced core business, high growth potential and intensive technological contents." Its development was a strategic move of the SZSE who was seeking to engage the small- and medium-scale businesses which account for a majority of Guangdong's local economy. It is worth noting that there is no equivalent counterpart to the SME Board in the Shanghai Stock Exchange. The SME Board has injected new life into the SZSE's business and also made the SZSE more competitive relative to the Shanghai Stock Exchange.

The China Merchants Bank (CMB)

In 1987, the China Merchants Bank (CMB) opened as Shenzhen's first bank wholly owned by shareholders. Two decades later, the CMB had become a formidable player on the national market with competitive profitability and higher asset quality than most other commercial banks in China. In 2002, the CMB was listed in Shanghai and four years later it was listed in Hong Kong, China.

In 2007, the CMB accomplished a symbolic step towards becoming a global bank: it began operating in the world financial centre of New York. This achievement is also significant for Chinese banking, because the CMB is the first Chinese bank approved by the United States Federal Reserve Bank since the 1991 "Act of Enhanced Supervision of Foreign Banks". As of 31 December 2007, 40 branches and 534 sub-branches of the bank spread all over China, and more than 1 000 banks all over the world are doing business with the CMB.

Source: SZSE, "Shenzhen Stock Exchange Overview", *www.szse.cn/main/en/aboutsse/sseoverview/*, accessed 20 April 2009; CMB, "Corporate Information", *http://english.cmbchina.com/CMB+Info/aboutCMB*; CSRC (2009), "China's Capital Market Development Report, 2009", *www.csrc.gov.cn/n575458/n776436/n804882/n4261170/11406522.html*, in Chinese.

Major phases of economic change in Guangdong province

Guangdong province has experienced rapid and deep urbanisation and industrialisation over the last 30 years. Since 1978, Guangdong underwent four major phases of economic change:

1. Pre-reform era, during which there was little investment in industry.
2. Stage reforms (1980-early 1990s), during which Guangdong was chosen as the test bed for wide-ranging economic reforms.
3. PRD-led boom (1990s-2000), when the Pearl River Delta achieved the world's largest concentration of low- and medium value-added manufacturing, acquiring the moniker "The World's Factory".
4. Restructuring? (2000-present), when the "PRD Model" began to falter, and was replaced by the pursuit of new areas of economic growth that reduce Guangdong's reliance on low value-added industry.

Pre-reform era

Guangdong was one of China's most lagging provinces prior to economic reforms that began in 1978. In 1952, Guangdong ranked 18th among the country's 30 provinces in per capita national income (CNY 88). From 1952 to 1978, per capita national income growth was only 3.1% per year. Per capita growth of industrial output value was 8.3%, the 10th lowest rate among all provinces (Duncan and Tian, 1999).

Several factors explain this low level of performance. First, the local economy was underdeveloped. Historically, the province's economy had largely been based on agriculture, benefiting from the rich soils and water resources of the Zhujiang Delta and the western coastal plateau. Except for Guangzhou, there were no cities of any significant size, and little industry. Internally, sub-provincial markets were limited to towns serving the local hinterlands. Second, for political reasons, the borders with Hong Kong, China and Macao, China were virtually closed in 1949, and foreign influence was tightly controlled. There was almost no foreign trade as China turned inward. In 1964, the central government began to relocate industrial production from coastal provinces to western China.[10] What little industry existed in Guangdong at that time was either relocated or subsequently severely under-invested. The third major factor contributing to the province's lagging development was the relatively low level of education among its largely rural population.

By 1979, social engineering policy failures and natural calamities across the country engendered the second phase of economic change. The failing agricultural sector left 70-80% of China's rural labour force either unemployed or underemployed (Riedel, 2007). Agricultural output and productivity had stagnated across the country. In this context, economic reforms began in 1979 in the agricultural sector, and were instrumental in the introduction of urban industrial reforms, starting in the mid-1980s.

Staged reforms (1980-early 1990s)

Under Deng Xiaoping, China's government gradually initiated three major sets of reforms starting in the late 1970s: *i*) major shifts in the structure of agricultural production; *ii*) pricing reforms; and *iii*) opening up contacts and investment to the outside world. Guangdong figured prominently in all three.

i) Prior to 1979, agricultural production was organised into collectives where farmers worked together on collectively-owned land to meet state production quotas. In the mid-1970s, faltering production led farmers in Anhui and Sichuan to begin experimenting with a household-based production system in which use rights to specific parcels of land were given to individual households. In 1978, the major output and income improvements in these experimental collectives convinced the central government to extend the model to other provinces, including Guangdong. It formally replaced the commune system with a new "household responsibility system" in 1982 (Wang, 2008). This granted households use rights over land parcels (which remained collectively owned) under a 30-year contract; once state quotas were met, surpluses could be sold at market prices.

ii) The second major shift was characterised by the change in price controls for agricultural products and the liberalisation of planned targets for yield, outputs, and sown areas. State prices paid for grain increased by 20-50% in 1979. Throughout the 1980s, they were gradually liberalised and expanded to other agricultural products until price controls were virtually eliminated by 1993.

These two reforms provided farmers with production incentives that propelled output and incomes; by 1984, farmers' average income, in real terms, was 2.5 times higher than the 1978 level. This had a profound impact on Guangdong, especially in the fertile Pearl River Delta: rising incomes strengthened the fiscal capacities of township and village governments at a time when decentralisation in many sectors was giving them greater autonomy. By the early 1990s, a major – and largely unexpected – impact of agricultural reforms began to emerge. As agricultural productivity increased, fewer farmers were needed to meet the demand. This provided a larger and growing pool of unskilled and semi-skilled labour for manufacturing. Increased agricultural output also contributed to the initial boost to exports in this crucial stage of the reform period, especially when the national policy of growing grain was abandoned, allowing specialisation in cash crops.

The labour surplus and industrial reforms in the mid-1980s favoured the development of township and village enterprises (TVEs)[11] which began to rapidly emerge in Guangdong, Jiangsu, and Shandong provinces. TVEs focused on light manufacturing to supply domestic markets. From 1980 to 1990, TVEs' share in national gross industrial output increased from 5% to 20%, and, nationwide, TVE employment surged to 93 million from 30 million (Wang, 2008). TVE growth was fuelled by decades of pent-up demand, especially in urban areas, and rising household incomes in both the countryside and in cities.

One of the reasons that Guangdong was selected for testing economic reforms was its comparatively low level of state ownership of firms. In 1980, 63% of industrial firms were state-owned; by 1985, the proportion had dropped to 52.5% and by 1989 to 37.6% (Mody, 1997). In contrast, small collectively-owned enterprises (below the township level), private firms, partnerships and joint ventures with foreigners accounted for 9.9% of industrial firms in 1980, 17% in 1985, and 33.9% in 1989.

iii) The third major reform – opening up to foreign investment and (selectively) to foreign influence – was realised through bold experimentation, starting in Guangdong and Fujian provinces. After decades of isolation, Deng Xiaoping recognised that China's development must be tied to global markets. "Special economic zones" (SEZ) were conceived as the means to gradually introduce foreign investment and technology to China in a very controlled way. SEZs were to be specially designated areas with precise frontiers within which foreign firms could invest in manufacturing for export with a range of fiscal and policy incentives, including the waiver of import duties on machinery,

facilitation of residency procedure for expatriate managers and technical personnel, a reduced corporate income tax rate of 15%, profit repatriation, and simplified entry and exit procedures.

Three SEZs were established in January 1980 in Guangdong: *i*) in Zhuhai, on the border with Macao, China;[12] *ii*) in Shantou near the border with Fujian province (now part of the Shantou/Jieyang/Chaozhou Cluster); and *iii*) in Shenzhen, on the border with Hong Kong, China.[13] A fourth SEZ was established in October 1988 in Xiamen in Fujian province opposite Chinese Taipei.[14]

The SEZs were conceived as territories that would operate under a market system and be fuelled by foreign investment in export processing of manufactured goods. For the first few years, the absence of clear laws and regulations deterred foreign firms, including from Hong Kong, China, and it was not until 1984 that any significant manufacturing investment began to occur. To promote SEZs' development, Deng Xiaoping made a symbolic trip to Shenzhen in 1984 and declared that "special economic zones are to be China's windows to the world". That year, Guangzhou and 14 other coastal cities were fully opened to foreign investment. After Deng Xiaoping's 1984 inspection tour, Shenzhen became the most popular SEZ for foreign firms, beginning with those from across the border in Hong Kong, China. Hainan was designated as an SEZ in the late 1980s. Then, in early 1995, the Pearl River Delta, the Yangtze River Delta, and the Zhangzhou-Quanzhou-Xiamen region in Fujian province were fully opened to foreign investment.

The Chinese government selected SEZs based on their strategic locations: Shenzhen was to benefit from spillovers from Hong Kong, China, over which China was to regain sovereign control in 1997; Zhuhai was to align with Macao, China, the second colony to be reintegrated; Xiamen was opposite the straights of Chinese Taipei where cultural and family ties were strong; and Shantou was also supposed to benefit from the proximity of Chinese Taipei and perhaps also Hong Kong, China. Aside from the political issues, the government recognised that overseas Chinese businesses in Hong Kong, China and Chinese Taipei were likely to be the first to engage with China in direct investment and technology transfer. Growth among the SEZs was uneven from the start, with the highest levels of investment occurring in Shenzhen. Because SEZs' borders were strictly enforced,[15] spillovers to other parts of the province did not begin to occur until the late 1980s; these were limited to the inner Pearl River Delta, especially to Dongguan, but also to Guangzhou, Foshan, and Zhongshan. There is little evidence that SEZs had any impacts on the structure and pace of development elsewhere in Guangdong.

Despite limited spillovers from the SEZs, growth in Guangdong as a whole accelerated markedly during this period driven by the rapid emergence of TVEs, the establishment of the three SEZs, and the growing supply chain relationships between TVEs and foreign-invested firms in the SEZs. From 1978-1993, Guangdong's per capita GDP growth rate was 11.26%, the highest in China; growth in per capita industrial output value was 19.81%, the second highest in the country after Zhejiang province (Duncan and Tian, 1999). The Industrial output value of non-state-owned enterprises in Guangdong was 38.1% during this period, almost triple the 14% growth of state-owned firms.[16]

Conditions were set in the 1980s that led to a PRD-led boom in development starting in the early 1990s. Compared to other coastal regions, the PRD's emerging structure in light industry was diverse – a wide range of outputs, from textiles to shoes, toys, watches, processed foods, and light machinery began to be produced. The Inner PRD was clearly the focal destination of foreign investment, largely from Hong Kong, China but

increasingly from Chinese Taipei as well. Its human capital was comparatively stronger than elsewhere in Guangdong, and at least a rudimentary network of roads had been established in the Inner PRD.

Guangdong's PRD-led boom (early 1990s-2000)

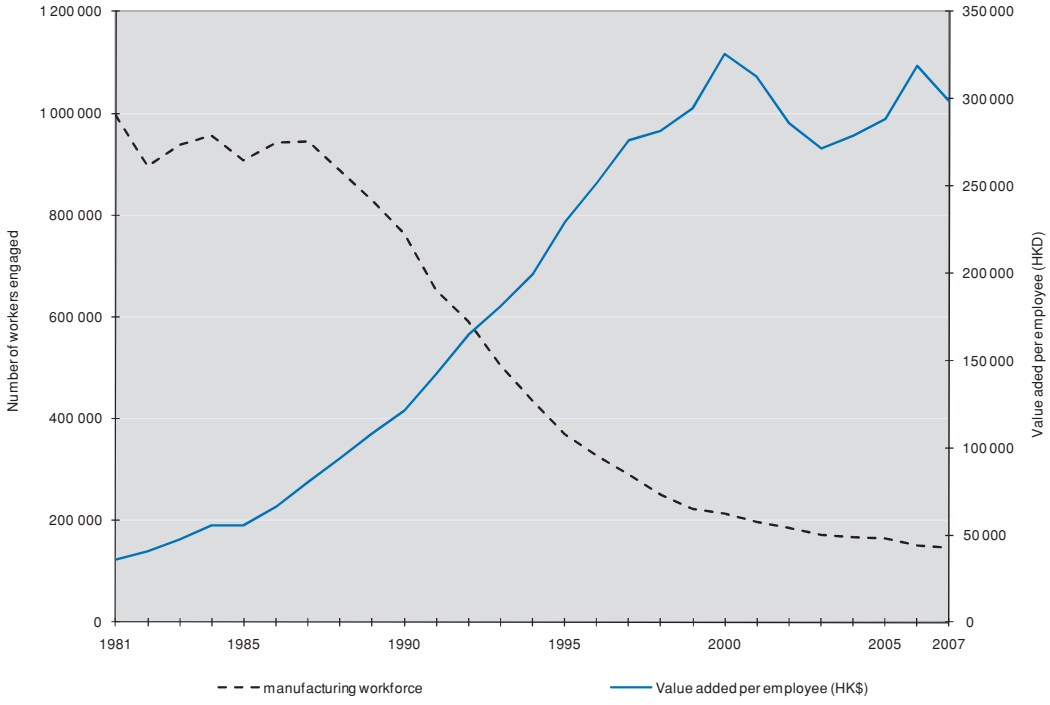
Against the backdrop of a decade of reforms, improving regulatory frameworks for foreign investors, and increasing decentralisation of investment approvals to local governments, several converging factors led to a boom in Guangdong during the 1990s that was largely concentrated in the Inner PRD: *i*) massive relocation of Hong Kong, China's manufacturing capacity to the PRD, and the associated restructuring of Hong Kong, China's economy into a global centre for trade and finance; *ii*) recommitment to reform as a central tenet of government policy; *iii*) acceleration in the globalisation of supply chains which relocated component manufacturing to developing countries; *iv*) the return of Hong Kong, China and Macao, China to mainland China; and *v*) Hong Kong, China's emerging role as a financial centre for mainland China.

Perhaps the most important factor for Guangdong's boom was the relocation of Hong Kong, China's industries to the PRD. Increased land and labour costs in Hong Kong, China during the late 1980s – in concert with the globalisation of supply chains in the late 1980s that led to massive off-shoring of manufacturing by multinationals in Southeast Asia – began to threaten the competitiveness of Hong Kong, China's manufacturers. Industry in the territory was generally low value-added in textiles, toys, luggage and simple electronics. The SEZs, with their low land costs, tax breaks, and access to China's huge pool of low-cost, surplus labour, provided a natural outlet for Hong Kong, China's firms to relocate their production. After almost a decade of exposure to the reform process, confidence was high enough for these firms to very rapidly shift production (which, given the nature of outputs, was not capital intensive). This process began in 1987 but accelerated such that, by the year 2000, Hong Kong, China's manufacturing workforce had shrunk by 80%. The remaining 20% was redirected toward much higher value-added manufacturing (Figure 1.27).

Another important factor in Guangdong's rapid growth was the significant relocation that occurred beyond the Shenzhen and Zhuhai SEZs. By the 1990s, TVEs had generally become uncompetitive and town governments began looking for alternatives to manufacturing. As decentralisation increased,[17] local governments began to pursue greater returns by building multi-tenant factory space that could be rented out to Hong Kong, China's manufacturers, or "leasing" land outright to them. Although this practice contravened national laws on land-use rights, it was treated as a "grey area" by regulators who did not want to curtail economic growth in the PRD. Large swaths of farmland, especially along the eastern flank of the Inner PRD in Dongguan and suburban Shenzhen, were transformed into plants for low value-added, original equipment manufacturing (OEM)[18] initially for Hong Kong, China firms, and then to firms from Chinese Taipei.[19] These plants created an almost instant demand for un- and semi-skilled workers. However, local residents had little incentive to take up these jobs as the new and substantial revenue flows from rentals and leases were distributed to existing households. Migrants from elsewhere in Guangdong, and increasingly from other provinces, poured into the PRD to fill the demand for labour in such large numbers that by the year 2000 there were 22 million migrants working in the Pearl River Delta.[20] Whole towns were transformed in this process. For example, Changan Town in Dongguan had 595 000 residents in 2000 among which 561 500 were migrant workers (94.4%). Other

towns, such as Lecong in Shunde, Guzhen in Zhongshan, and Humen in Dongguan became "single industry towns" in furniture, lighting, and apparel. Virtually all of the manufactured outputs were exports.

Figure 1.27. **Manufacturing workforce and productivity change in Hong Kong, China, 1981-2007**



Source: Industrial Production & Tourism Statistics Section, *Hong Kong Census and Statistics Department database*, *www.censtatd.gov.hk.*

As price and distribution controls were liberalised in the early 1990s, wholesale markets began to appear across the Inner PRD, giving rise to a new spatial economic organisation. Wholesale markets attracted small and medium-sized industries, and gradually became what could loosely be described as "partial clusters", i.e. concentrations of firms benefiting from proximity to buyers. Producers of intermediate inputs were subsequently attracted to or near what become known as "specialised towns". By 2007, there were 228 "specialised towns" in Guangdong (GDPG, 2009a). This rapid, intensive, and extensive development in the Inner PRD was initially driven by firms from Hong Kong, China and then Chinese Taipei. It occurred, however, at a time of rapid globalisation of manufacturing off-shoring. Multi-national corporations (MNCs) had begun to offshore extensively in the 1980s, focusing on countries in Latin America and Southeast Asia. During the 1990s, as the economics of off-shoring to these regions became obvious, MNCs began to consider Chinese locations. While Hong Kong, China and Chinese Taipei firms continued to predominate in the Inner PRD, MNCs from Japan, the United States, and Europe gradually began to locate in the other parts of the Pearl River Delta as well.

Two important political events occurred in the 1990s that had major impacts on the evolution of the PRD. The first involved Deng Xiaopong's high-profile "southern tour" (covering Shenzhen and Zhuhai) in January 1992 during which he repeatedly stressed the need for "high-speed growth" (Lam, 1993). His message was translated in the pivotal Document No. 2 that became the blueprint for renewed economic reforms, including extending the "Open Door" policy to more than 30 cities which acquired *de facto* SEZ status. This series of events had an ambiguous impact on the PRD and Guangdong generally. On the one hand, the "Guangdong model" was re-affirmed at the highest levels, reinforcing foreign firms' confidence in the province, which led to greater investment – especially from Hong Kong, China, and Chinese Taipei. On the other hand, it increased competition from the rest of China, especially the Yangtze River Delta anchored in Shanghai. The second major political event was the return to China of Hong Kong, China in 1997 and Macao, China in 1999. The two became special administrative regions of the People's Republic of China, enjoying virtual autonomy in governance of all affairs except for national defence and foreign affairs. Instruments such as the two "Basic Laws" reassured residents and investors that the SARs' capitalistic economies would be allowed to continue for at least "another 50 years". By the late 1990s, this new political context had made clear the importance of heightened development co-ordination, including strategic infrastructure and environmental management. Despite sensitivities on both sides, all levels of government recognise that better economic integration of the two SARs with the PRD in particular is a win-win outcome.

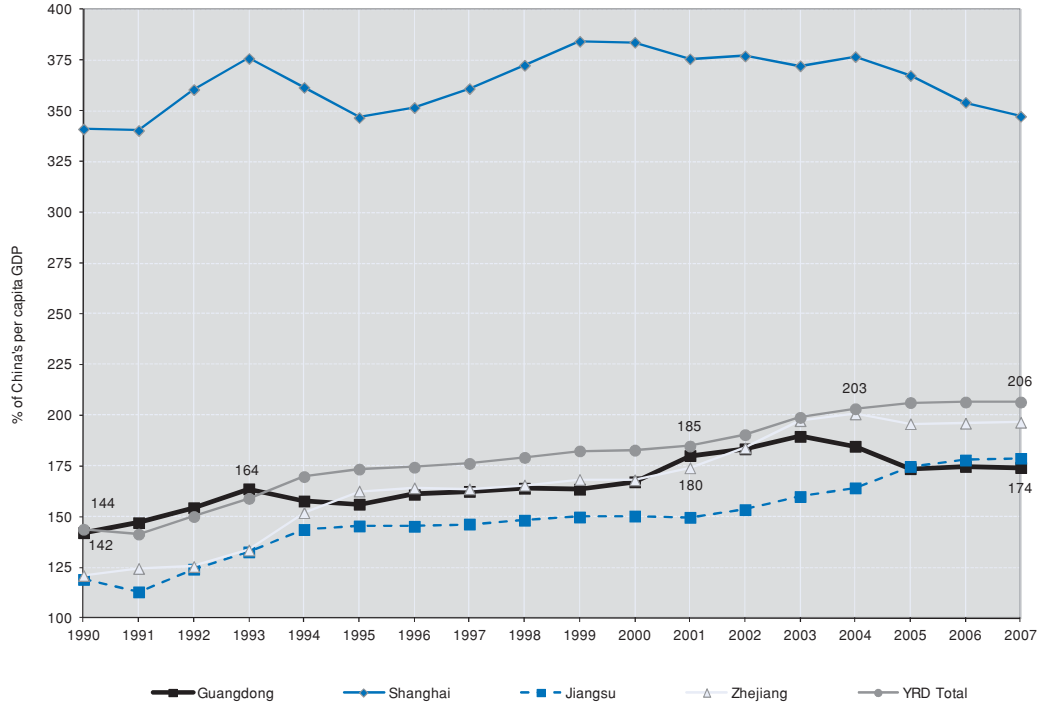
Restructuring? (2000-present)

By the end of the 1990s, the Guangdong economic model, started to show some signs of weakness. Rapid industrialisation and urbanisation in the PRD led to a high concentration of population and economic activities in successful metropolitan areas like Shenzhen and GuangFo (Guangzhou and Foshan) which affected the structure of regional development with the emergence of agglomeration diseconomies, notably in the form of congestion costs, energy shortages and cross-border pollution. Given the speed and intensity of economic and urban/rural change in the Inner PRD, transport and infrastructure bottlenecks quickly became serious issues. A "superhighway" was rapidly built from Hong Kong, China to Guangzhou by private interests,[21] but access roads remained heavily congested during peak hours. Power outages were common for several years until Guangdong's capacity was upgraded through extensive development of new, largely thermal generating plants. Ports were built in Shekou and Yantian in Shenzhen, and later in Guangzhou. Huge airports were constructed in Zhuhai, Shenzhen, and Guangzhou in tandem with the development of Hong Kong, China's new airport at Chek Lap Kok on Lantau Island.

Some of this infrastructure was built rapidly and in the absence of a PRD-wide, integrated development strategy, which might have resulted in diseconomies of scale in duplicated facilities, and uncontrolled suburban and corridor development. From 1990 to 2000, built-up land area in the Inner PRD grew by over 300% in a pattern of sprawl that was hitherto unknown in China (see Section 4.1, Figure 4.3). The uncontrolled and sprawling growth of urban constructed area and industry has resulted in serious environmental challenges to the region.

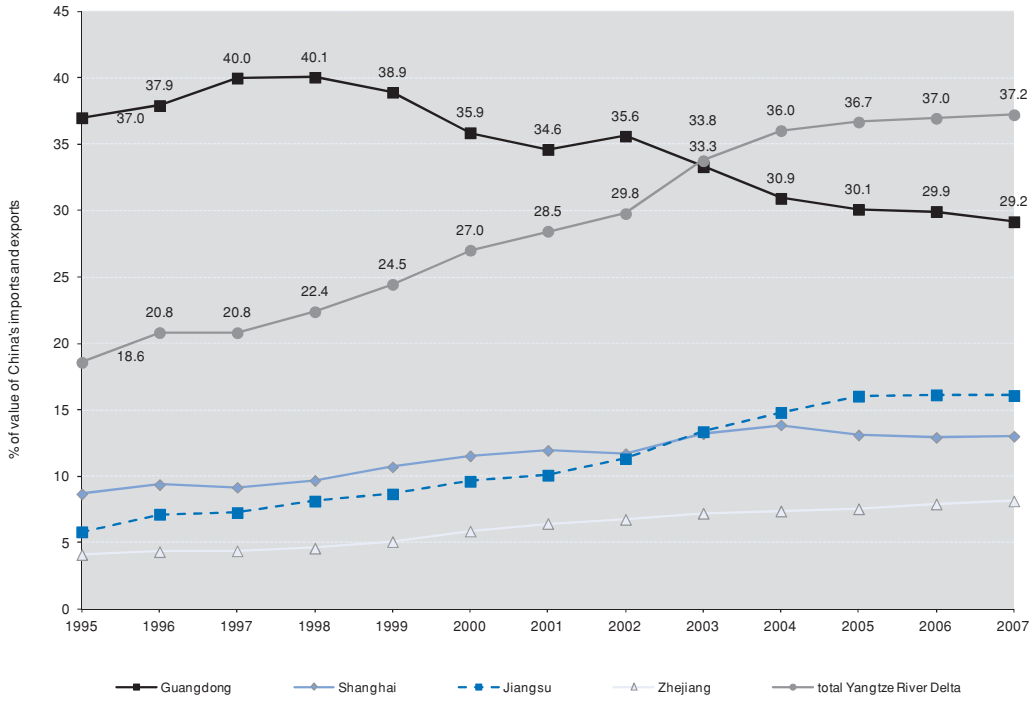
In the late 1990s, Guangdong's growth started to slow. Initially fuelled by the relocation of export-oriented industries from Hong Kong, China, the 1990s was a boom period for the Inner PRD, initially centred on the Shenzhen SEZ but quickly expanding to all other municipalities. However, Guangdong experienced a spurt in productivity and prosperity up until the first three years of the 1990s that declined in 1994, and remained steady until the end of the decade (Figure 1.28). In comparison, the Yangtze River Delta's (YRD) take-off lasted a year longer, and productivity gradually continued to improve, albeit at a more measured pace. A central tenet of Guangdong's growth was its pivotal position in China's global trade. Not only had the Inner PRD become the world's largest export processing zone, but exports from the rest of Guangdong and from neighbouring provinces flowed through the province's ports and airports. By 1998, 40% of China's exports were from Guangdong (Figure 1.29). However, by the end of the decade, Guangdong's share of China's trade dropped to 36% – an early signal of the province's ebbing competitiveness.

Figure 1.28. **Trends in relative per capita GDP, selected provinces and regions, 1990-2007**



Source: National Bureau of Statistics of China database, *www.stats.gov.cn/english/statisticaldata/yearlydata*; *CEIC database*, *www.ceicdata.com*.

Figure 1.29. **Change in the share of China's external trade (%), 1995-2007**



Source: National Bureau of Statistics of China database, *www.stats.gov.cn/english/statisticaldata/yearlydata*; *CEIC database*, *www.ceicdata.com*.

Notes

1. Since 2009, the Outer Pearl River Delta has included the full prefectures of Zhaoqing and Huizhou, following a change in the definition by the Guangdong Provincial government.

2. Apart from more general data at the municipal level in the *Statistical Yearbook*, data are available on the population of statutory towns, townships, and street committees from the 2000 National Census of China. The most recent population data available at the scale of prefecture-level cities for Guangdong are for 2008; these data were derived from a 1% sample survey conducted by the Guangdong Statistical Bureau. Importantly, this sample survey followed the same process as the 2000 National Census, counting migrants with residency longer than 6 months. Aside from the 2000 National Census, there is no official, current assessment of the size and spatial distribution of Guangdong's population below the administrative level of the prefecture-level city.

3. Statutory towns, townships, and street committees are the lowest statistical units in China's year 2000 census.

4. Densities are calculated through a kerning process, using a 4-kilometre radius from every point; this radius has been tested against 9m Landsat at satellite imagery for 2000/2001 and has been found to conform, on average, to built-up urban and suburban areas better than any other radius.

5. This second factor is linked to three types of policy measures: *i)* conversion of agricultural to non-agricultural *hukou* for rural residents, permanently relocating to towns within their counties; *ii)* land reforms designed to create secondary markets in farming rights by allowing farmers to permanently sell off their rights to other farmers to encourage economies of scale in production; and *iii)* promotion of industrialisation in towns with implied approval of conversion of agricultural land to town construction land (largely for industrial parks).

6. The gap between the permanent population and the registered population represents the inflow of migrants from other provinces (permanent population = registered population + migrants from other provinces). The result of 13 million differs from previous estimates of 19 million due to different methodologies: 13 million was estimated by the Provincial Statistical Bureau based on the census method, while 19 million was estimated by the Provincial Department of Labour and Social Security based on internal surveys (Guangdong Provincial Government, 2009).

7. In Guangdong, the provincial government sets minimum wage levels, which are adopted by municipal governments (GDPG, 2006).

8. As appeared in *Guangdong Statistical Yearbooks* of various years, the statistical data for the PRD region includes nine prefectures: Guangzhou, Shenzhen, Zhuhai, Foshan, Jiangmen, Dongguan, Zhongshan, Huizhou and Zhaoqing.

9. The "primary sector" includes agriculture, forestry, fishing, etc. The "secondary sector" includes manufacturing, construction, energy, etc. The "tertiary sector" comprises all other industries not included in the primary or secondary sectors, represented by service sectors.

10. Responding to growing Cold War tensions, in 1964 the central government launched a "Third Front Line" (*sanxian*) Programme of relocating the country's industries from vulnerable coastal and central cities (the "first front line" and "second front line" respectively in national defence terms) to western regions.

11. TVEs as an institution began to wane across China in the early 1990s due to their weak competitiveness arising from diseconomies of scale, low levels of investment in technology upgrading, and weak capacities to obtain and assimilate market information.

12. Macao was a colony of Portugal at the time. It became a special administrative region with Chinese sovereignty in 1999.

13. In 1898, China leased the New Territories, including Hong Kong, China and what is now the Kowloon Islands, to the United Kingdom for 99 years. After 2 years of negotiation, in 1984, UK and China signed the Sino-British Joint Declaration on the Question of Hong Kong (the Joint Declaration). It outlined the "one country, two systems" model for Hong Kong, China, conceived by Deng Xiaoping, under which the territory would return to Chinese sovereignty but retain its capitalist system and way of life for 50 years. The government of the special administrative region of Hong Kong retained a high degree of autonomy, except in foreign affairs and defence, which came under the sovereign control of China. A "mini-constitution", known as the Basic Law, was enacted in 1990 that described the relationship between the government of China and the Hong Kong, China government.

14. Initially, SEZ policy provisions were applied in 1979 only to Shekou, a small port area (about 1 square kilometre) in Shenzhen (which was then a fishing village of 30 000) controlled by China Merchant Steam Navigation Ltd., a Hong Kong-based arm of China's Ministry of Communication. They were extended to the rest of Shenzhen and the other three SEZs less than a year later (Sit, 1985).

15. Since its inception, the Shenzhen SEZ has been completely encircled with security fencing; entry into the SEZ, including by trucks heading to the ports in Hong Kong, China, is through a border checkpoint. All visitors require special permits to enter the SEZ, issued by the Public Security Bureau in their home city or county.

16. Interestingly, research on the drivers of industrial growth in 6 coastal provinces during the period 1985-1989 found that: *i)* industrial specialisation had a largely negative effect on growth; *ii)* foreign investment had a very strong positive impact (a 10% increase in foreign investment raised the growth rate by 1%); *iii)* secondary school enrolment rates were strongly correlated with growth; and *iv)* infrastructure endowment, especially of roads and telecommunications, yielded increasing returns (Mody, 1997).

17. For a description of the decentralisation process in China during this period, see Kamal-Chaoui *et al.* (2009).

18. The term, OEM (original equipment manufacturer) refers to companies that make products for others to repackage and sell. Resellers buy OEM products in bulk, minus

the costly retail packaging that comes with individually sold units. The product itself is essentially the same as its more expensive, retail-packaged sibling. OEM products are used in many industries, but are perhaps most prevalent in electronics. The success of OEM in Guangdong carries a significant downside as the economy seeks to restructure. OEM inherently requires minimal innovation as contractors are simply producing intermediate inputs to technical standards and specifications prepared by others. It is also highly volatile as OEM capacities improve in less expensive producer markets, such as Vietnam and Bangladesh.

19. Town governments, that had been sponsors of the surge in TVEs in the 1980s, became *de facto* real estate developers in the 1990s.

20. Local villagers quickly recognised another real estate opportunity emerging from the influx of migrants: constructing basic, village housing (including medium-rise buildings) to rent out to migrant workers.

21. The USD 1.5 billion project was completed in July 1994, and was a 50/50 joint venture of the Guangdong provincial government and Hopewell Holdings Ltd. of Hong Kong, China.

Chapter 2

Main challenges faced by Guangdong's economic development model

This chapter analyses the main competitiveness challenges for Guangdong. It starts with an analysis of trends in production capacity in the different sub-regions of the province highlighting an important industrial restructuring process, especially in the inner Pearl River Delta, with new drivers of productivity concentrated in some parts of the province. While the recent period signals recovery, these past trends have pointed out the need to climb the value chain and to reduce the strong reliance on exports by focusing more on the domestic demand. These challenges need to be addressed in the context of intensive internal competition in the higher value chain segment especially the Yangtze River Delta (YRD) where Shanghai is re-emerging as China's principal metropolis. They also need to take into account the strong regional disparities that the Guangdong economic model has generated with 79% of the GDP produced by the PRD and 64% by the three largest metropolitan regions (GuangFo, Shenzhen and Dongguan). The second part of the chapter discusses the main structural weaknesses that should be addressed to move up the value chain and reduce territorial imbalances, including a lack of advanced human capital, insufficient innovation capacity, trade obstacles and limited accessibility in some parts of the province.

Introduction

The Guangdong province has made remarkable progress in the past 30 years, transforming itself from a backward agricultural economy to a dynamic manufacturing-based economy, becoming the largest economy in China. Such a transformation process should credit the pilot position granted to the province by the Chinese central government in the "Open Door" policy. However, at the turn of the millennium, and within the context of widespread diffusion of economic reforms throughout the country and the integration of China into the global economy, Guangdong's economic model has started to display some signs of weakness. Decades of industrial relocation have made Guangdong a strong competitor in the global market. Despite Guangdong's emergence as the "World's Factory", its industry and export growth have been largely based on the expansion of low-wage manufacturing utilising imported components, equipment and technology. Most leading enterprises remain manufacturers and assemblers of products without possessing core technologies. Even in joint ventures, core technologies mostly remain controlled by foreign partners. Rising labour costs and limited land availability have weakened the locational advantages of the Guangdong province and the 2008-2010 global economic crisis aggravated the economic situation. Due to contracted external demands, Guangdong's exports have been severely affected and although precise data are not available, there are indications that the province has been the most severely hit by the crisis in China.

This chapter analyses the main competitiveness challenges for Guangdong. It starts with an analysis of trends in production capacity in the different sub-regions of the province highlighting an important industrial restructuring process, especially in the inner Pearl River Delta, with new drivers of productivity concentrated in some parts of the province. While the recent period signals recovery, these past trends have pointed out the need to climb the value chain and to reduce the strong reliance on exports by focusing more on the domestic demand. These challenges need to be addressed in the context of intensive internal competition in the higher value chain segment especially the Yangtze River Delta (YRD) where Shanghai is re-emerging as China's principal metropolis. They also need to take into account the strong regional disparities that the Guangdong economic model has generated with 79% of the GDP produced by the PRD and 64% by the 3 largest metropolitan regions (GuangFo, Shenzhen and Dongguan). The second part of the chapter discusses the main structural weaknesses that should be addressed to move up the value chain and reduce territorial imbalances, including a lack of advanced human capital, insufficient innovation capacity, trade obstacles and limited accessibility in some parts of the province.

2.1. Main economic challenges

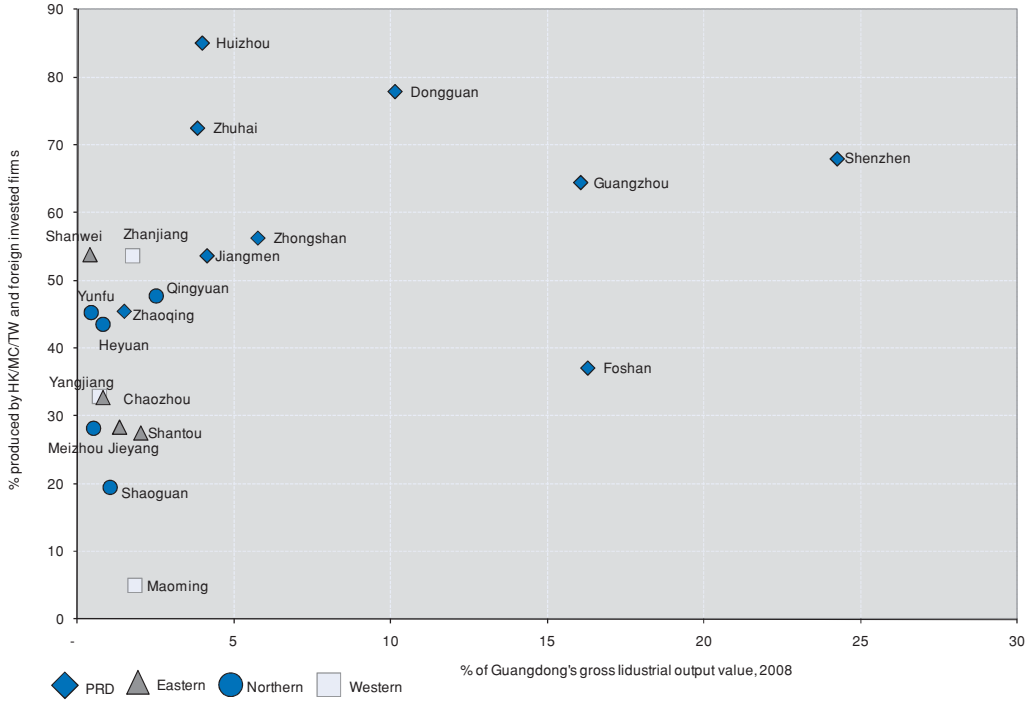
Industrial restructuring

Trends and change in production capacities within the province

The scale and capacity of production vary widely across Guangdong, largely due to uneven investment attraction. For example, four prefecture-level cities (PLCs) – Dongguan, Foshan, Guangzhou and Shenzhen – accounted for 67% of the province's

gross industrial output value in 2008 (Figure 2.1). There is a very strong correlation between the level of industrial output and the type of ownership of industrial facilities. This is especially true in the PRD where foreign firms and those from Hong Kong, China; Macao, China; and Chinese Taipei produced over half of the industrial output value in 7 of the 9 PLCs in 2008. These figures underscore the importance of attracting FDI into local manufacturing economies, and partly explain why local governments compete vigorously for inward investment.

Figure 2.1. **Prefecture-level cities' contribution to Guangdong's industrial output, 2008**

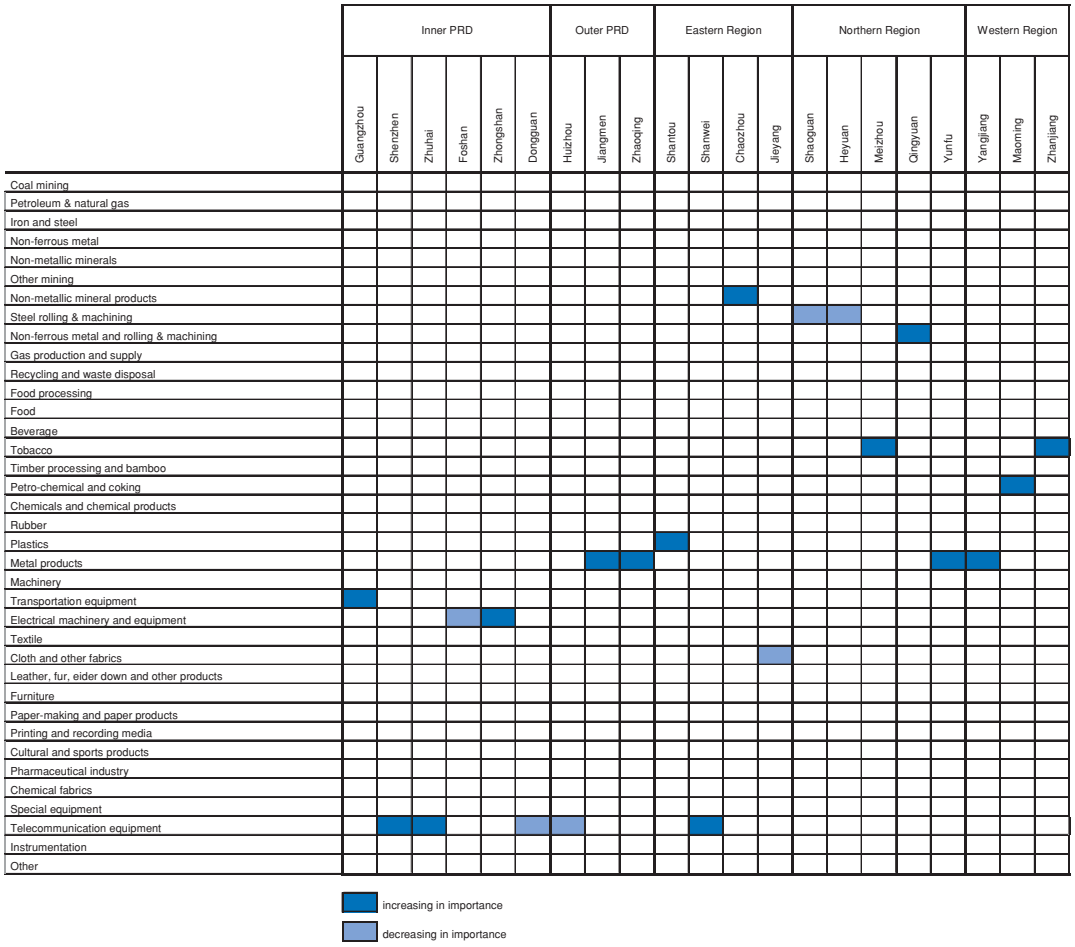


Source: *Guangdong Bureau of Statistics database*, *www.gdstats.gov.cn/tjnj/ml_e.htm.*

Analysing each PLC individually leads to a better understanding of Guangdong's diverse industrial economy. The industrial structure of each PLC has been analysed in terms of: *i*) volume of gross industrial output value in 2008; *ii*) trends in industrial concentration from 2000 to 2008, based on location quotients of gross industrial output value relative to Guangdong as a whole for both years; *iii*) productivity of all sectors in each PLC in terms of average gross output value per firm; and *iv*) comparison of these productivity levels against provincial averages (Annex A). The summary findings of this analysis highlight the diversity of the provincial economy, including traditional and new heavy industries as well as light industries (Figure 2.2). This analysis also revealed the uneven presence of export processing. While most of the PRD is export oriented, export processing is not a mainstay in Foshan, Guangzhou Shenzhen. Dongguan, Zhongshan, Zhuhai and Jiangmen do appear to be heavily reliant on export processing, much of which is relatively low value added.

Trends in the core industries' output values over 2000-2008 highlight an important industrial restructuring, especially within the PRD. Across Guangdong, the core industries' output values increased in 15 PLCs but decreased in the remaining 6. Half of the declining PLCs are in the PRD, including two in the Inner PRD and one in the Outer PRD. This contrasts with other regions: the Eastern Region's core industries are growing in three of its four PLCs, for the Northern Region the figure is three out of five PLCs, and in the Western Region all three PLCs' core industries are growing. Declining trends in some PLCs underscore the importance of industrial restructuring in the PRD.

Figure 2.2. **Largest gross industrial output value by sub-sector for Guangdong prefecture-level cities**



Note: Trends measured in terms of change in location quotient, 2000-2008.

Source: Author's calculation from data of *Guangdong Provincial Statistical Yearbook*, 2009.

Trends in the core industries' output value within the different sub-regions highlight their various economic priorities:

- In **the Inner PRD**, there is an imperative to climb the value chain in export processing, and restructure industries to focus on domestic demand. For example, "export processing" allowed companies to benefit from paper thin profit margins by importing, assembling, and re-exporting via Hong Kong, China. Such a system depends on the simultaneous import of primary goods and the export of manufactured goods. Recent trends point to increasing challenges for manufacturing in the PRD, such as rising labour costs and limited availability of land (Ding, 2008; GDPG, 2009a). This concerns the economies of Dongguan, Zhongshan, Zhuhai and Jiangmen which appear to be heavily reliant on export processing, much of which is relatively low value added. Moreover, parts of the PRD, such as Dongguan, are specialised in a few sectors making it more vulnerable to external shocks.
- **The Outer PRD** could possibly benefit from restructuring in Inner PRD cities. As it is demonstrated in the section on accessibility, it could become a viable location for industrial relocation from the Inner PRD.
- **Peripheral regions in the east and north** generally have a high presence of traditional industries, focusing on the processing of commodities. Many of these industries are growing, helping to fuel industrial growth elsewhere in China. While national market demand is likely to remain strong, these industries will require technological upgrades over the next decade as production capacities diminish due to ageing equipment. This could create major financing demands from firms in the commodity processing sectors.
- **The Western Region** is heavily specialised in energy and petrochemicals, neither of which is a particularly strong generator of sustained employment for the local workforce that lacks the advanced technical skills required by these two industries. Industrial diversification should be a high priority for industrial policy and investment in the Western Region.

New drivers of Guangdong's productivity

There appear to have been two main drivers of Guangdong's productivity so far this decade:

i. increased share of higher value activity in ICT; and

ii. an important shift from light to higher value-added heavy industry.

i) Telecommunications and electronic equipment manufacturing (largely computers, networks, and peripherals) grew significantly as a share of Guangdong's industrial output value from 2000-2007 (5.3% and 1.7% share increase respectively) (Figure 2.3). In telecommunications equipment, much of the increase has been from the astounding growth of a very few large companies, especially Huawei based in Shenzhen (Box 2.1). In electronics, the bulk of growth appears to have been from large and medium enterprise (LME) investments in higher value-added components, such as flat-screen televisions and light emitting diode (LED) screens. Again, this growth has largely been concentrated in a few firms, notably TCL Corporation based in Huizhou, and an offshoot, TTE Corporation established in 2004 in Shenzhen as a joint venture with Thomson SA of France.

Box 2.1. **Huawei Technologies**

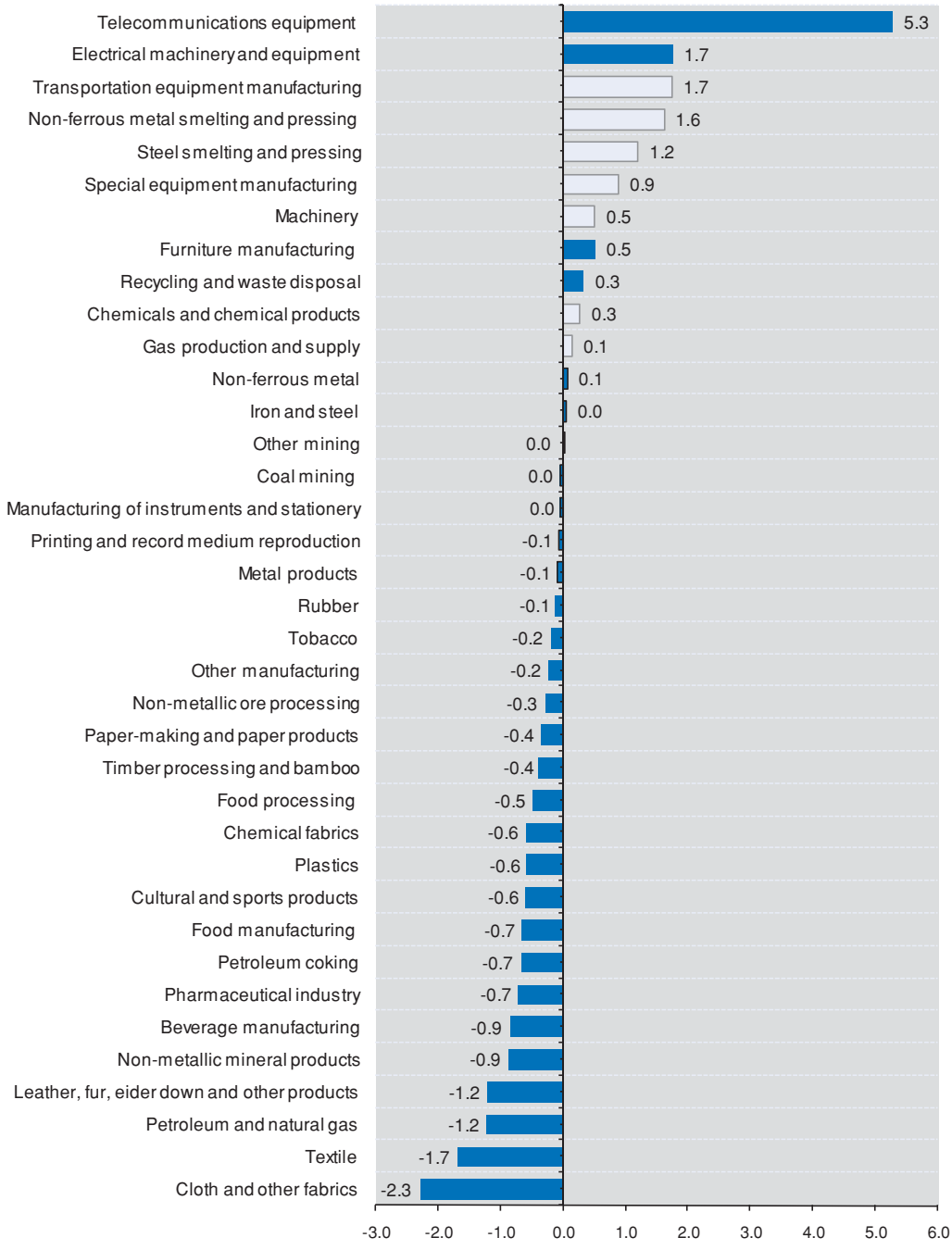
Huawei, a Chinese telecommunication equipment manufacturer, was set up in the Shenzhen special economic zone in 1988 by 4 young electrical engineers with an initial registered capital of CNY 24 000. It has mushroomed in the last 20 years from a small private firm into a multinational enterprise with dozens of product lines delivered through a global operation of 8 regional headquarters, more than 100 branch offices, 12 research and development (R&D) centres and 28 regional training centres. It remains a privately held company. Huawei's products and solutions are deployed in over 100 countries and serve over 1 billion users worldwide. It employs over 35 000 people, including 90% with a bachelor's degree or higher and 43% devoted to R&D which has propelled Huawei into the position of 4th largest patent applicant under the Patent Co-operation Treaty (PCT) of the World Intellectual Property Organisation (WIPO). Throughout its rise, Huawei has competed against other ICT MNEs to provide all-IP communications systems that meet the same international telecommunications norms.

Though it is not yet one of the Global 500 largest firms, Huawei has made incredible headway over the last 5 years. In 2007, Huawei achieved global contract sales of USD 16 billion – a 45% year-on-year increase from 2006, of which 72% came from international markets. International sales have become the major driver of sales growth for Huawei, with products sold in more than 90 countries, including the United States, the United Kingdom, France, Portugal, the Russian Federation, Brazil, Singapore and Thailand, and serving 22 of the world's top 50 operators. Huawei achieved growth of more than 150% in developed markets such as Europe, Japan and the United States. In 2007, Huawei was awarded 45% of all new UMTS/HSPA contracts, 2 types of frontier ICT, earning Huawei the top position in this market. Huawei has also become one of the top 3 suppliers in the global GSM market, serving a total of over 300 million GSM users worldwide. Most notably, China Mobile awarded Huawei a 23.6% slice of a GSM Group Purchase Project valued at USD 700 million. In addition, Huawei's market-leading mobile soft switches – software that connects phone calls – now serve more than 670 million subscribers.

Source: Huawei Technologies Co., Ltd. (2009), "Huawei Annual Report 2009", *www.huawei.com/corporate_information/annual_report/annual_report_2009.do*.

ii) While the share of ICT in Guangdong's industrial output grew by 7% over 2000-2007, heavy industry's share also grew by 6.4% during this period (e.g. transportation manufacturing, steel rolling, etc., see Figure 2.3). Trends in higher value-added heavy industry are particularly important as they show a diversification of the provincial economy away from the lower value-added assembly and manufacturing of the 1990s, such as in textiles and fabric production. The biggest shift toward heavy industry was sparked by Japanese investment in the automotive sector. Japanese automobile manufacturers have actively moved in to the Inner PRD, starting in 1998 when Honda acquired a plant from departing Peugeot.[1] Toyota and Nissan started construction of major plants following China's WTO accession in late 2001. All three companies were initially serving the domestic market. By 2007, Guangdong's national market share in passenger vehicles had increased to 16.6% from 5.4% in 2002, just behind Shanghai's 17.2% (Kwan, 2008).

Figure 2.3. **Growth of Guangdong's share of gross industrial output by sub-sector, 2000-2007**



Note: Light blue bars are heavy industry; growth refers to the difference between the share of the sub-sector in the year 2007 and 2000.

Source: Guangdong Bureau of Statistics database, *www.gdstats.gov.cn/tjnj/ml_e.htm.*

The petrochemical sector, including refineries, is another promising heavy industry for Guangdong. While the share of oil, gas, and petrochemicals in the province's total industrial output value declined from 2000-2007, huge investments are being made in these sectors; invested facilities are just now coming on stream, and are likely to have significant impacts on the Guangdong's economy in the next five years.[2] China National Offshore Oil Corp (CNOOC) has invested over CNY 120 billion in the province, and in 2008 alone, it invested CNY 33 billion in Guangdong. CNOOC is planning on investing an additional CNY 300 billion in the province over the next 5 years to develop oil and gas fields in the South China Sea, construct petrochemical projects in Huizhou, and build a natural gas pipeline in the region. In the west, Sinopec has built huge refineries in Maoming and Dongxing (Zhanjiang).[3] Kuwait and Sinopec have recently announced plans to construct a USD 9 billion refinery in the city of Zhanjiang in the Western Region. Both Huizhou and Zhanjiang already house major oil reserves, and are expected to be selected as one of four national strategic underground oil reserve locations.

Emerging internal competitors

Restructuring efforts towards a higher value-added industrial economy is never smooth, especially with intense competition for high value-added investments from within China. The PRD's most important competitor is the Yangtze River Delta (YRD), which today compares – and competes – with the Pearl River Delta.[4] Both regions are roughly similar in GDP, per capita GDP, population, and land area (Table 2.1). As mentioned before, Guangdong was the target of experimental economic reforms during the 1980s. However, the widespread application of these reforms across the country during the 1990s unleashed productive capacities that led to more rapid growth and deeper structural changes in the YRD. Several data support this trend:

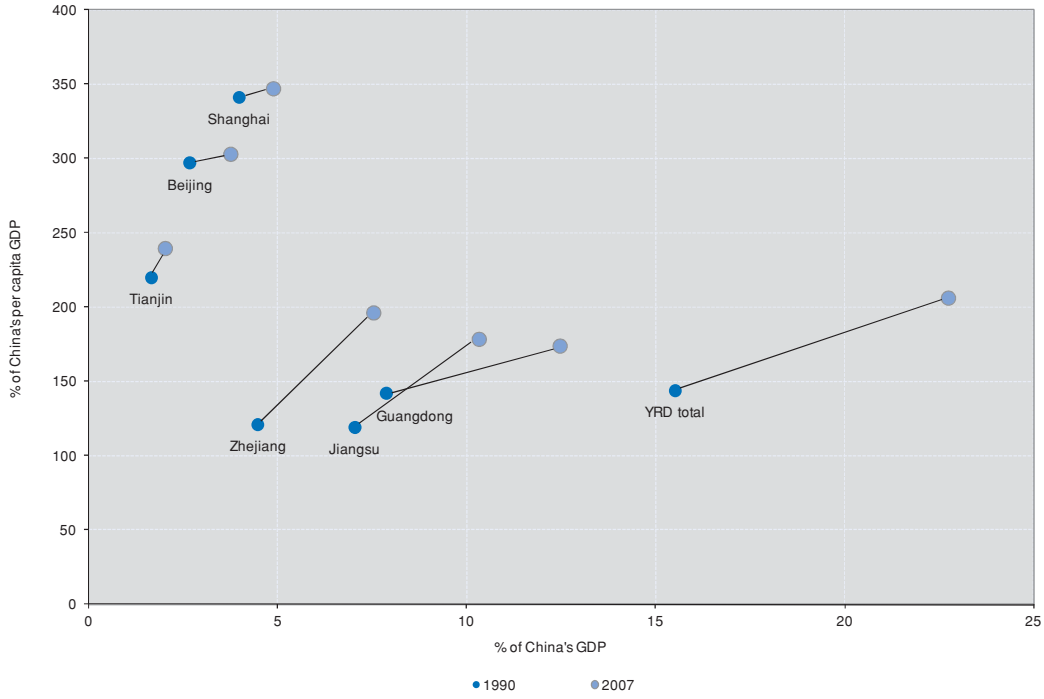
- **Share of China's GDP.** While Guangdong contributed an additional 5.4% to China's GDP over 1990-2007, reaching 12.5% in 2007, up from 7.1% in 1990, the YRD's share increased from 15.5% to 22.7% (an additional 7.2%) over the same period (Figure 2.4). Most of the YRD growth came from rapid development in Jiangsu and Zhejiang provinces that began to reap spillover agglomeration benefits from Shanghai's re-emergence as China's principal metropolis.

Table 2.1. **Comparison of Guangdong/Hong Kong, China/Macao, China and the Yangtze River Delta provinces, 2007**

	Land area (km2)	Population	Population density inh/km²	GDP (CNY)	Per capita GDP (CNY/person)	GDP/km² (CNY/km²)
Guangdong	179 810	94 490 000	525	3 108 440 000 000	32 897	17 287 359
Hong Kong, China + Macao, China	1 103	7 155 900	6 488	1 716 511 197 309	239 874	1 556 220 487
Guangdong + SARs total	180 913	101 645 900	562	4 824 951 197 309	47 468	26 670 008
Shanghai	8 240	18 580 000	2 255	1 218 885 000 000	65 602	147 922 937
Jiangsu	106 740	76 250 000	714	2 574 115 000 000	33 759	24 115 749
Zhejiang	105 400	50 600 000	480	1 878 044 000 000	37 115	17 818 254
YRD total	220 380	145 430 000	660	5 671 044 000 000	38 995	25 733 025

Source: National Bureau of Statistics of China database, *www.stats.gov.cn/english/statisticaldata/yearlydata*; *CEIC database*, *www.ceicdata.com*.

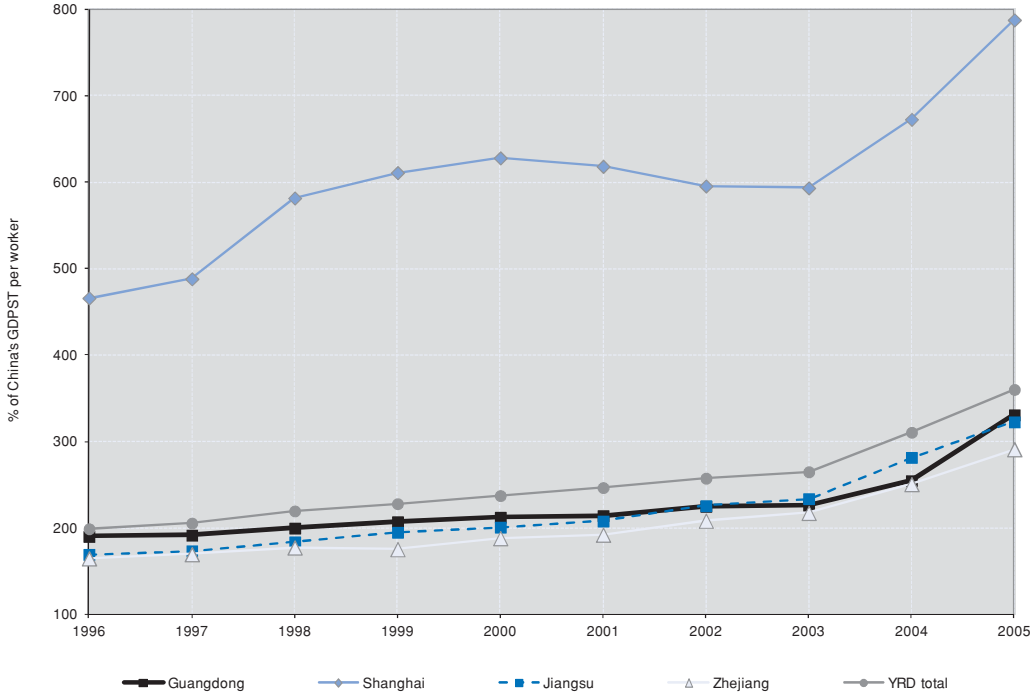
Figure 2.4. **Comparative trends in economic development in Guangdong and the Yangtze River Delta, 1990-2007**



Source: National Bureau of Statistics of China database, *www.stats.gov.cn/english/statisticaldata/yearlydata*; *CEIC database*, *www.ceicdata.com*.

- **Productivity.** Moreover, as the YRD began to develop in the 1990s, its productivity level began to surpass Guangdong's in 1996, whereas before they had been roughly equal (Figure 2.5). While productivity growth in the YRD has been largely driven by Shanghai, fast growth in two other provinces surrounding Shanghai, Zhejiang and Jiangsu, have caught up too and even outpaced Guangdong's productivity since the early 2000s.
- **Investment attraction.** YRD has replaced Guangdong as China's leader in attracting FDI. Guangdong's share of China's FDI decreased from 41.8% in 1990 to 27.7% in 2000 (*NBS China database*). In contrast, YRD's share grew from 24.9% in 1995 to 27.5% in 2000 (*NBS China database*). Even on a provincial basis, since 2006, Jiangsu province from YRD has started to attract more FDI than Guangdong, accounting for 23.4% of China's total FDI in 2005-2008, whilst Guangdong's percentage was 18.8% over the same period.

Figure 2.5. **Changes in non-farming productivity, 1996-2005**

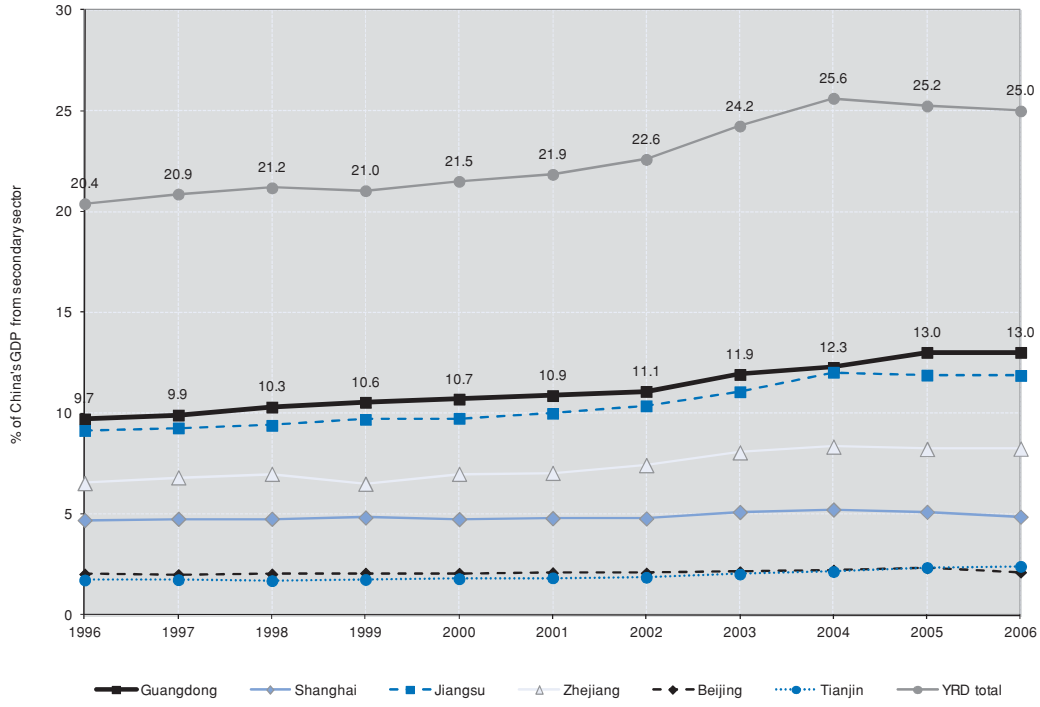


Note: The figure shows non-farming GDP per registered worker in both regions (e.g. GDP from the secondary, largely manufacturing, and tertiary services sectors).

Source: National Bureau of Statistics of China database, *www.stats.gov.cn/english/statisticaldata/yearlydata*; *CEIC database*, *www.ceicdata.com*.

- **Share in China's industrial production.** ICT and heavy industry were primarily responsible for Guangdong's expanding share of GDP from China's secondary GDP increasing from 10.7% in 2000 to 13% in 2005, a share that appears, for now, to have stabilised. However, the share contributed by the YRD was significantly larger during this period: it rose from 21.5% of China's secondary GDP in 2000 to 25% in 2006, double the share increase of Guangdong (Figure 2.6). Part of the difference is explained by rising productivity in the YRD and its provinces resulting from foreign investment in even higher value-added production than in Guangdong (Figure 2.5).

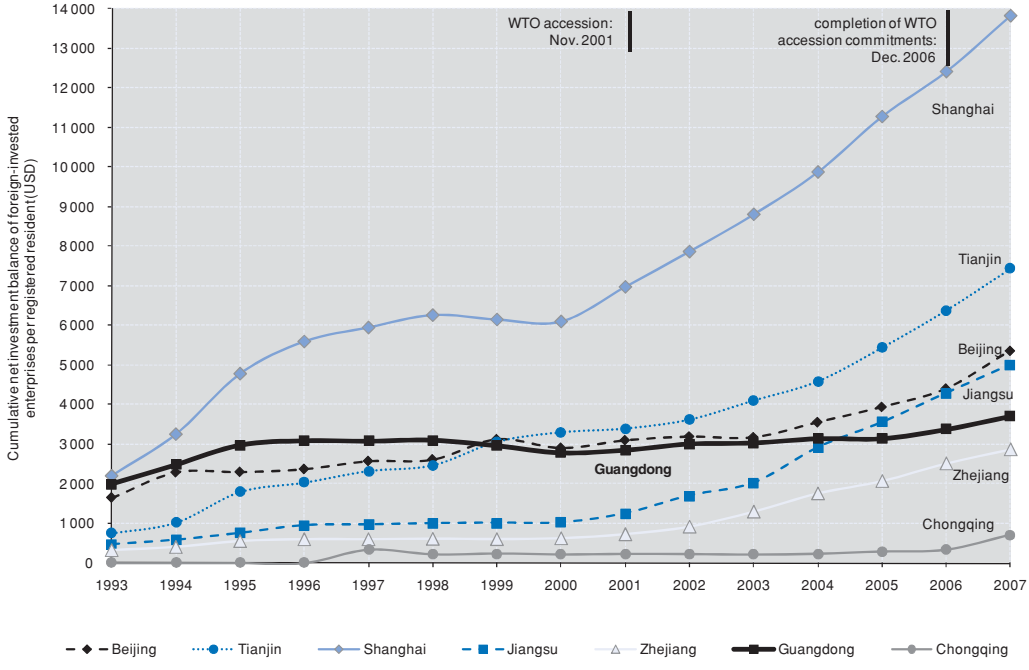
Figure 2.6. **Shifts in the share of China's industrial production, 1996-2006**



Source: National Bureau of Statistics of China database, *www.stats.gov.cn/english/statisticaldata/yearlydata*; *CEIC database*, *www.ceicdata.com*.

While the province has for a while absorbed huge amounts of FDI, it faces difficulties in retaining and attracting higher value-added activities. FDI in projects with quick returns has a weak impact on sustained economic development.[5] In accumulative terms, Guangdong remains one the main destinations in China for FDI (18.8% of the national total for 2005-2008, the 2nd highest rate in China). However, when normalised on a per capita basis,[6] the cumulative balance in Guangdong has not changed appreciably since the initial boom period of the early 1990s: foreign investors, largely from Hong Kong, China and Chinese Taipei, took out of Guangdong as much as they put in. This contrasts sharply with the cumulative balances in Shanghai, Jiangsu, and Zhejiang where net foreign capital has grown significantly since China's WTO accession; the same can be said for Beijing and Tianjin (Figure 2.7). On an annual basis, the net balance of foreign-invested capital began to rise in key provinces upon China's accession to WTO in 2001, and generally continued to grow in the YRD, Beijing, and Tianjin until 2007. However, Guangdong's net rate has not changed substantially; by 2007, Chongqing had caught up with Guangdong on a per capita basis (Figure 2.8). Guangdong's low rate of foreign capital retention was not affected by WTO accession, which suggests that foreign firms seeking to enter new, generally higher value-added and more capital-intensive markets, may have chosen locations other than Guangdong. For Guangdong, the key concern is that the YRD, Beijing and Tianjin are attracting far more durable and forward-looking FDI with profits that, though accruing later, are being re-invested locally. If foreign firms are to contribute to Guangdong's industrial restructuring, the province will need to attract far more committed investors (in more advanced and higher value-added industrial sectors) than it has to date.

Figure 2.7. **Cumulative net investment balance of foreign-invested enterprises per registered resident (USD per capita)**

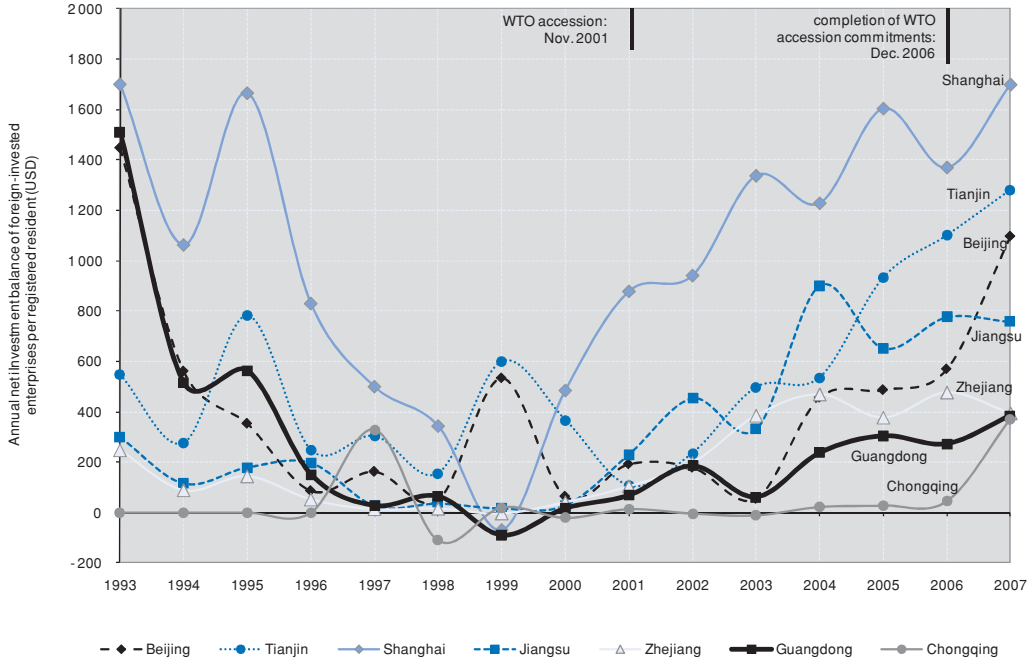


Source: National Bureau of Statistics of China database, *www.stats.gov.cn/english/statisticaldata/yearlydata*; *CEIC database*, *www.ceicdata.com*.

Vulnerability due to strong reliance on exports

Due to its high reliance on export markets, Guangdong has been one of the provinces most affected by the global economic crisis of 2008-2010. Since 2008, shrinking global demand has resulted in a sharp fall in total exports and foreign capital inflow in the province, similar to that of China (Figure 2.9). Guangdong's growth rate for exports decreased from 22.3% in 2007 to 5.6% in 2008, dropping another 10% to 20% monthly (year-over-year growth) in the first half of 2009 (*Guangdong Bureau of Statistics database*). As a result, GDP growth slowed from 14.7% in 2007 to 10.1% in 2008, and further reduced to 5.8% in the first quarter 2009. The PRD region was most affected, since its economic growth decreased considerably in the first quarter of 2009. Dongguan and Zhuhai have even recorded negative growth rates (Table 2.2). The lack of real time labour surveys in China makes it difficult to provide accurate figures on the impact on employment. However, official estimates are that of the 136 million migrant workers in China, 15.3% lost their jobs in late 2008 and early 2009 (Chen, 2009; Cai *et al.*, 2009). With 27 million migrant workers in Guangdong, one could project a large impact in the region. Another estimate for the PRD predicts that around 590 000 migrant workers lost their jobs due to widespread factory closures in 2008 (Yu and Zhang, 2009).

Figure 2.8. **Shifts in net investment balance of foreign-invested enterprises per registered resident (USD), selected provinces, 1993-2007**

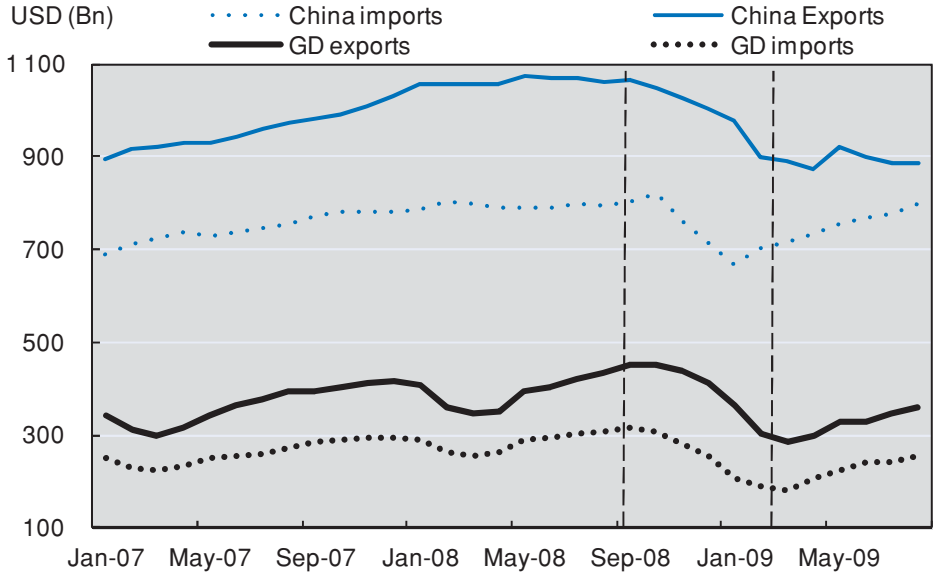


Note: The overall downward slide in China during the latter half of the 1990s reflects the repatriation by foreign investors of capital after the Asian Financial Crisis, and investment in real estate and lower risk, short-term manufacturing during this period.

Source: National Bureau of Statistics of China database, *www.stats.gov.cn/english/statisticaldata/yearlydata*; *CEIC database*, *www.ceicdata.com*.

Figure 2.9. **Evolution of exports and imports during the downturn, Guangdong and China**

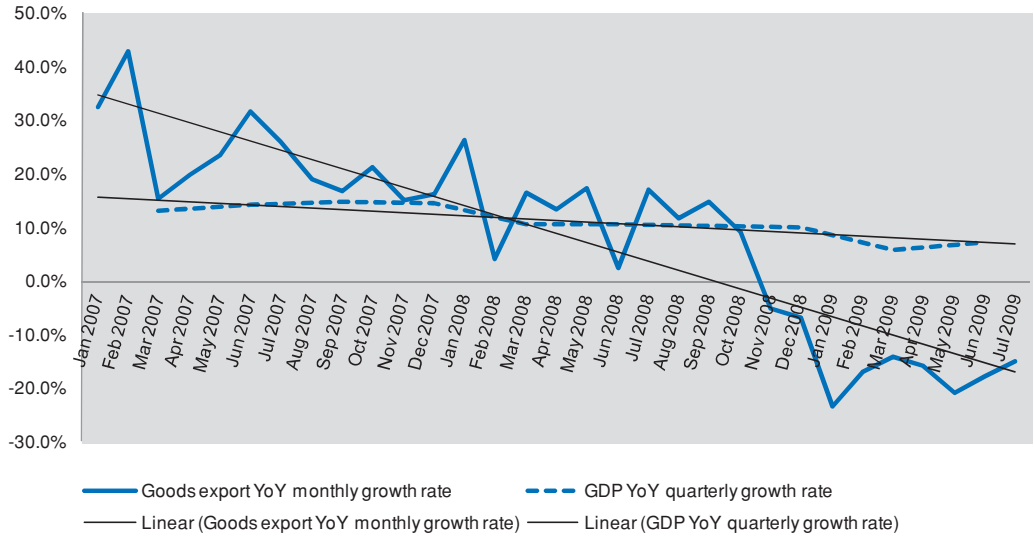
Billions USD annualised, three-month moving average, at constant 2000 prices



Source: OECD (2010), *OECD Economic Survey of China*, OECD Publishing, Paris; *Guangdong Bureau of Statistics database*, *www.gdstats.gov.cn/tjnj/ml_e.htm.*

The degree to which Guangdong's economy is dependent on the export of goods remains an open question. Common methods of using export-to-GDP ratios or net export-to-GDP growth ratios are not without controversies (He and Zhang, 2009; Anderson, 2007). For instance, in 2007, Guangdong reported the total goods export-to-GDP ratio to be 90%, but this obviously does not mean that the export sector is almost the size of the total economy. One alternative measure is the recent work by Koopman *et al.* (2008), which argues that the Chinese economy is less dependent on exports than demand-side indicators would suggest. According to their calculations, *GDP contributed by goods exports value-added* was around 16%, while *China's goods export-to-GDP ratio* in 2008 was 33%, therefore China's *share of domestic value-added in goods exports* is 49% (OECD, 2010c).[7] Assuming Guangdong has the same *share of domestic value-added in goods exports* as China (49%), we could replicate the methodology of Koopman *et al.* for the province.[8] In 2008, Guangdong's *goods export-to-GDP ratio* was 79.2%, compared to 33% nationally. Based on China's 49% *share of domestic value-added in goods exports* (Koopman *et al.*, 2008), Guangdong's *GDP contributed by goods exports value-added* would probably be around 38%, indicating that a 10% decline in goods export is, on average, associated with a 3.8% decline in GDP growth. In sum, it is the magnitude of export drop and Guangdong's dependence on exports that led to a large dent in growth, especially considering spillover effects on investment, employment, income and consumption (Cui *et al.*, 2009). Such association could be observed in the trends from late 2008 suggesting a sharp decline of year-on-year monthly export growth of exports in Guangdong province, together with the slowdown of the provincial economy (Figure 2.10).

Figure 2.10. **Year-on-year monthly export growth rate and quarterly GDP growth rate, Guangdong**



Note: Gaps in quarterly GDP growth data are filled by the moving average.

Source: Guangdong Bureau of Statistics database, *www.gdstats.gov.cn/tjnj/ml_e.htm*; *CEIC database*, *www.ceicdata.com.*

Table 2.2. **Quarterly economic growth in the Pearl River Delta, 2008-2009**

PLCs	1st quarter, 2008	2nd quarter, 2008	3rd quarter, 2008	4th quarter, 2008	1st quarter, 2009	2nd quarter, 2009	3rd quarter, 2009
Guangzhou	11.1	11.9	12.1	12.3	8	8.5	10.5
Shenzhen	10.2	10.5	11.5	**12.1**	**6.5**	8.5	9.6
Foshan	11	17	16.8	15.2	11	12.2	12.9
Dongguan	16.2	16		**14**	**-2.3**	0.6	3.1
Zhongshan	13.68	11.95	11.3	10.5	6.27	7.29	8.85
Jiangmen				10.8	6	6.3	9
Huizhou	10.6	12	11.1	11.5	8.2	10.4	12.8
Zhuhai	13.1	12	7.1	**9**	**-5.1**	0.9	4.1
Zhaoqing	12.8			**14**	**8.1**	10.3	11.6
Provincial	10.5	10.7	10.4	**10.1**	**5.8**	7.1	8.6

Note: Bold text indicates PLCs with sharpest decline.

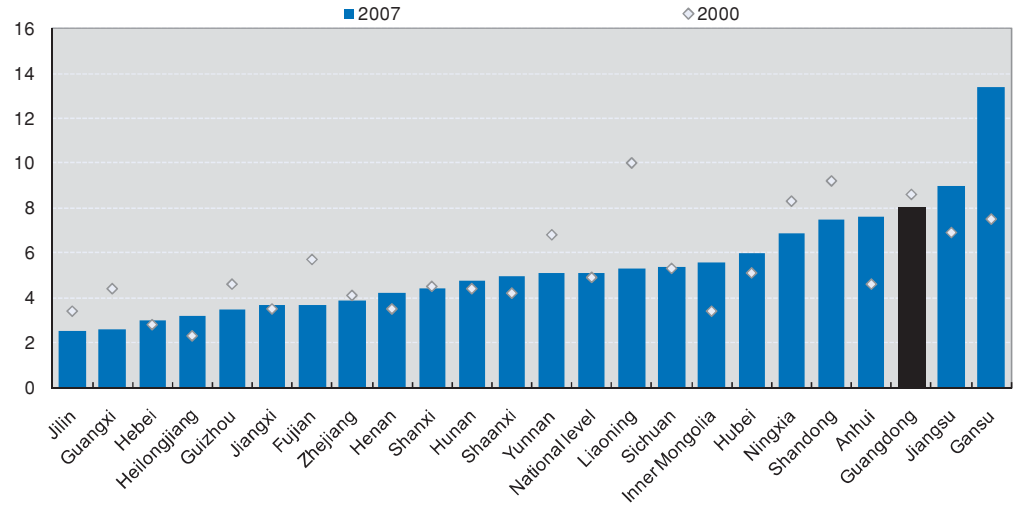
Source: Guangdong Bureau of Statistics database, *www.gdstats.gov.cn/tjnj/ml_e.htm*; *CEIC database*, *www.ceicdata.com.*

High regional disparities

Guangdong's internal regional disparity (intra-provincial disparity) is among the highest of all Chinese provinces. Li and Xu (2008) point out that intra-provincial disparity accounts for 57.2% to 61.6% of the total value of disparity in China, larger than inter-provincial differences. As for Guangdong, the province had the third highest intra-provincial disparity rate in China in 2007, in terms of maximum to minimum ratio (MMR) of GDP per capita (Figure 2.11).[9] Other indicators, such as the Theil Index, point

to similar or even higher regional disparity rates for Guangdong.[10] For instance, Li and Xu's (2008) Theil Index calculation is that Guangdong had the highest regional disparity in China from 2001 to 2004 and the second highest in 2005. Compared to OECD member countries, Guangdong ranks the highest in terms of regional Gini co-efficient (0.4 in 2008) (Figure 2.12).

Figure 2.11. **Ratio of maximum to minimum GDP per capita of selected Chinese provinces, 2000 and 2007**



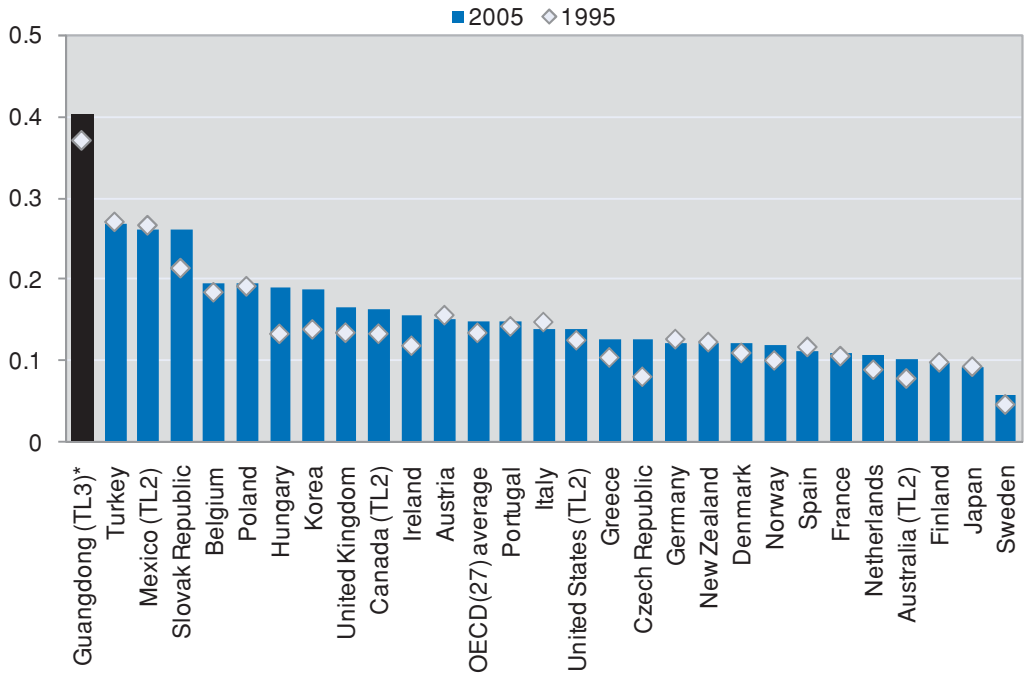
Source: CEIC database, *www.ceicdata.com*; Li and Xu (2008).

The origin of internal regional disparity in Guangdong is from the general divide between the prosperous PRD region and the relatively lagging non-PRD region. The PRD region, with less than one-quarter of the total provincial territory, has generated 82.7% of the whole provincial GDP in 2008. The Northern Region has one of the lowest per capita incomes in China, while the PRD region is among the highest. Ding (2008) argues that Guangdong's economy is constituted of two separate layers: the domestic ownership invested economy, which covers the whole province and the non-domestic ownership[11] invested economy, which covers only the PRD region. Besides the general picture of PRD versus non-PRD difference, several observations emerge from an in-depth review of the sub-regional performance (Table 2.3 and Figure 2.13):

- In 2007, the Inner PRD produced 70% of the provincial GDP, up from 58% in 1997. Inner PRD is the only region in Guangdong that recorded higher GDP per capita than the provincial average (+94%) and GPRD average (+36%).
- The highest levels of per capita GDP are found in Foshan, Guangzhou, Shenzhen and Zhuhai.
- While the Inner PRD clearly dominates Guangdong as a whole, it is not a uniformly developed sub-region: beyond the large metropolitan regions (GuangFo, Shenzhen), Dongguan and Zhongshan are almost half as prosperous.
- Spillovers to the Outer PRD do not appear to be occurring: the sub-region's per capita GDP was only half that of the Inner PRD in 2007.

- Growth in the other regions of Guangdong – including in the Outer PRD – has been far more restrained than the Inner PRD.
- The poorest parts of Guangdong are areas in the Eastern Region outside the Shantou/Jieyang/Chaozhou urban cluster (that exhibit lower GDP per capita than the provincial average, -64%), the Northern Region (-65%), and areas in the Western Region beyond the Coastal Corridor (-57%). The poverty levels of certain areas and populations within Guangdong are one element of the province's regional disparities (Box 2.2).
- While non-PRD is, in general, underperforming, growth in both GDP and GDP per capita share have been witnessed in two PLCs of the Northern Region (Qingyuan and Yunfu) (Figure 2.15).
- While Guangdong's growth has been driven by its large metropolitan regions, agglomeration benefits have not been realised in some urban clusters of the Eastern Region.

Figure 2.12. **Gini index of TL3 OECD regions and Guangdong, GDP per capita, 1995-2005**



Note: Data for Guangdong are from 2000 and 2008; author's calculation based on Gini index of GDP per capita.

Source: OECD regional database, http://stats.oecd.org/Index.aspx?datasetcode=REG_DEMO_TL2; Guangdong Bureau of Statistics database, www.gdstats.gov.cn/tjnj/ml_e.htm.

Box 2.2. **Poverty issues in Guangdong**

Income disparities are aggravated by poverty, particularly in remote rural areas. These regions still lag far behind the others and struggle to emerge, despite strong performance and prosperity in the highly urbanised PRD. Most impoverished rural regions are, for instance, rural villages in northern Guangdong, reservoir resettlement areas[1] and old revolutionary base areas.[2] For instance, of the more than 24 million people living in rural villages located in old revolutionary base areas, 10.5% fell under the official poverty line in the province. Guangdong's official poverty line has been defined as annual net income per capita below CNY 1 500, or USD 394, PPP, slightly higher than 1 USD per day. This is slightly higher than the national poverty level (CNY 1 196), yet lower than that in Jiangsu and Zhejiang provinces (CNY 2 500). In general, the number of households in Guangdong under the official poverty line increased from 0.87 million to 0.89 million over 2002-2007. While the percentage of the population under the poverty line in Guangdong declined from 4.65% in 2002 to 3.35% in 2007, 3 PLCs witnessed an increase in both the total number and the percentage of the population under the poverty line: Shantou, Meizhou and Qingyuan from 1.72%, 6.64%, and 6.41% in 2002 to 2.94%, 7.62% and 8.25% in 2007 respectively. In particular, Qingyuan PLC had the largest percentage of poverty population in Guangdong in 2007. This resulted from 3 counties in the PLC (Liannan, Lianshan and Yangshan counties), where natural conditions and living conditions are extremely harsh, e.g. with 536 000 inhabitants, Yangshan county's location on the limestone covered mountainous area with limited arable land. The 3 counties are among the 28 counties with official poverty designation from the central and Guangdong provincial governments.[3] Infrastructure is poorly provided in these counties, e.g. limited access to vehicle roads, electricity, and drinking water (GDPG, 2009a).

Notes:

1. Reservoir resettlement area indicates a place receiving population moved and resettled due to the construction of dams in their places of origin. Guangdong currently has received 1.3 million people from the reservoir resettlement population.

2. Old revolutionary base areas are revolutionary bases established by the army of the Communist Party during war times. Most of the old revolutionary base areas are villages located in remote rural areas.

3. The defining criteria for counties with official poverty designation (named as "counties with poverty alleviation focus") are based on a set of indicators, mainly the percentage of the population under the poverty line, income level of rural population, basic living standards, as well as GDP per capita, and fiscal revenue per capita, set by central and provincial authorities. These counties can receive direct fiscal support (e.g. grants) from central or provincial government.

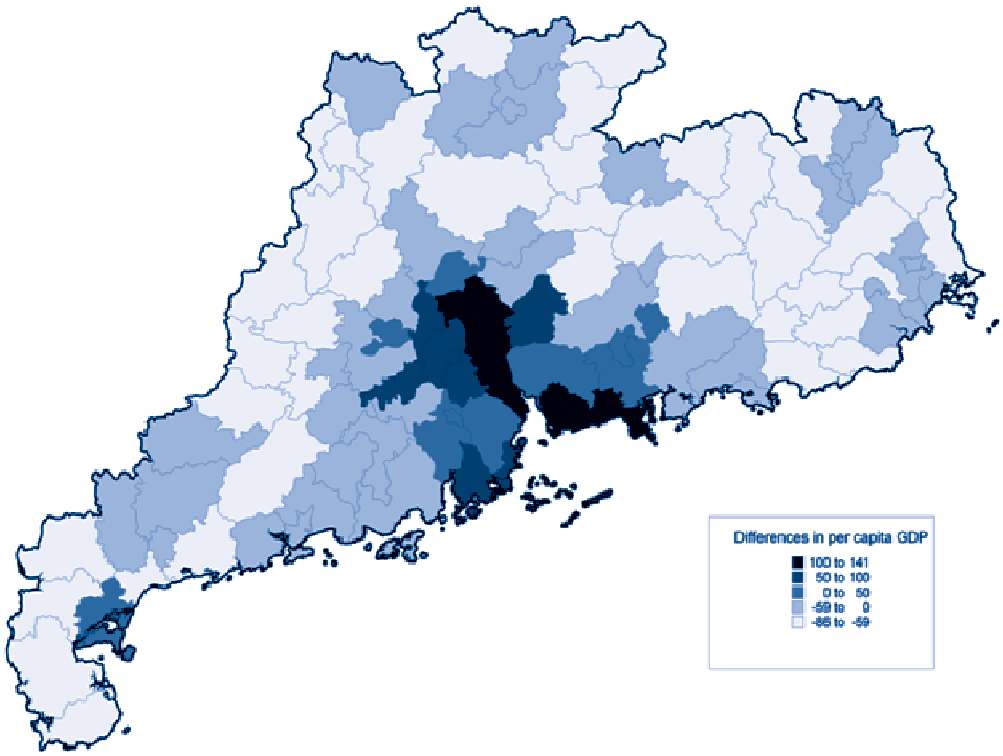
Based on these observations, it appears that the regional disparities within the Guangdong province are largely the result of an economic model dependent on attracting foreign investment. More than 90% of foreign enterprises in Guangdong locate in the PRD region, and seven-eighths of USD 800 billion FDI utilised by Guangdong from 1979 to 2008 has been invested in the PRD region. As mentioned in Chapter 1, the major reason for concentration in the PRD region is its proximity to Hong Kong, China, which has stood out as the dominant source of FDI (62%) in Guangdong over the past 30 years (*Guangdong Bureau of Statistics database*). Cost reduction and short travel times are the two major criteria for low value-added and labour-intensive Hong Kong, China firms choosing investment sites. The PRD region has become the best choice due to a sufficient supply of un- and semi-skilled workers, affordable land prices, and limited travel distance to Hong Kong, China.

Table 2.3. **GDP by region and sub-region, 2007**

		GDP			Per capita GDP		
		2007 (est.)	% total region	% of Guangdong	2007 (est.)	Differences in GDP per capita and the total regional level	Differences in GDP per capita and the Guangdong provincial level
Greater Pearl River Delta		4 277 303 767 309	86.79	79.6	82 207	70%	141%
	Hong Kong, China and Macao, China	1 716 511 197 309	34.83	0.0	239 874	395%	604%
	Inner PRD	2 246 511 860 000	45.59	69.8	65 904	36%	94%
	Outer PRD	314 280 710 000	6.38	9.8	29 134	-40%	-14%
Eastern Region		284 618 650 000	5.78	8.8	12 351	-75%	-64%
	Shantou/Jieyang/Chaozhou	165 760 670 000	3.36	5.2	14 820	-69%	-56%
	remainder	118 857 980 000	2.41	3.7	10 023	-79%	-71%
Western Region		259 602 850 000	5.27	8.1	14 762	-70%	-57%
	Coastal Corridor	102 635 400 000	2.08	3.2	21 922	-55%	-36%
	remainder	156 967 450 000	3.19	4.9	12 164	-75%	-64%
Northern Region		106 564 150 000	2.16	3.3	11 885	-75%	-65%
Total: Guangdong + two SARs		4 928 089 417 309			48 492	0%	42%
Guangdong province		3 217 449 760 000	65.29	100.0	34 057	-30%	0%

Source: Guangdong Bureau of Statistics database, www.gdstats.gov.cn/tjnj/ml_e.htm; Hong Kong Census and Statistics Department database, www.censtatd.gov.hk; Macao Statistics and Census Service database, www.dsec.gov.mo.

Figure 2.13. **Differences in per capita GDP of CLCs and the province of Guangdong**



Source: Author's calculation from data from the *Guangdong Bureau of Statistics database*, *www.gdstats.gov.cn/tjnj/ml_e.htm.*

Besides the general picture of PRD versus non-PRD gap, applying the OECD regional typology shows that economic performance is stronger in predominantly urban areas. Over 2000-2007, 5 out of 9 predominantly urban regions (PU) have been well performing, while most predominantly rural regions (7 out of 9) and all the 3 intermediate regions have experienced a decline in both shares of GDP and GDP per capita relative to the provincial average. Similar trends can also be witnessed in Zhejiang and Jiangsu provinces (Figures 2.14 to 2.16). Shenzhen (Box 2.3) and Dongguan, for example, could be the best cases to illustrate the fast urbanisation process and increasing economic growth.

Box 2.3. **Shenzhen: one of the world's most rapidly expanding metropolitan areas**

Shenzhen probably represents one of the most astonishing cases of rapid development in the world. Before being transformed in 1980 to a special economic zone (SEZ), it was no more than a small border city surrounded by agricultural lands, with a population of 20 000, mostly active in agriculture and fishing. By 2007, it represented 2.7% of China's total output. Before 1980, the industrial base was extremely weak (with less than 30 small enterprises whose total output did not reach USD 10 000), and infrastructure was practically non-existent. The area's only advantage was its proximity to Hong Kong, China, Macao, China and Chinese Taipei (Ng and Tang, 2004; Ge, 1999). The situation began to change in 1979, with the central government's first policy intervention, which focused on infrastructure and marked the beginning of a decade of steady growth in all economic indicators.

Box 2.3. **Shenzhen: one of the world's most rapidly expanding metropolitan areas** (*continued*)

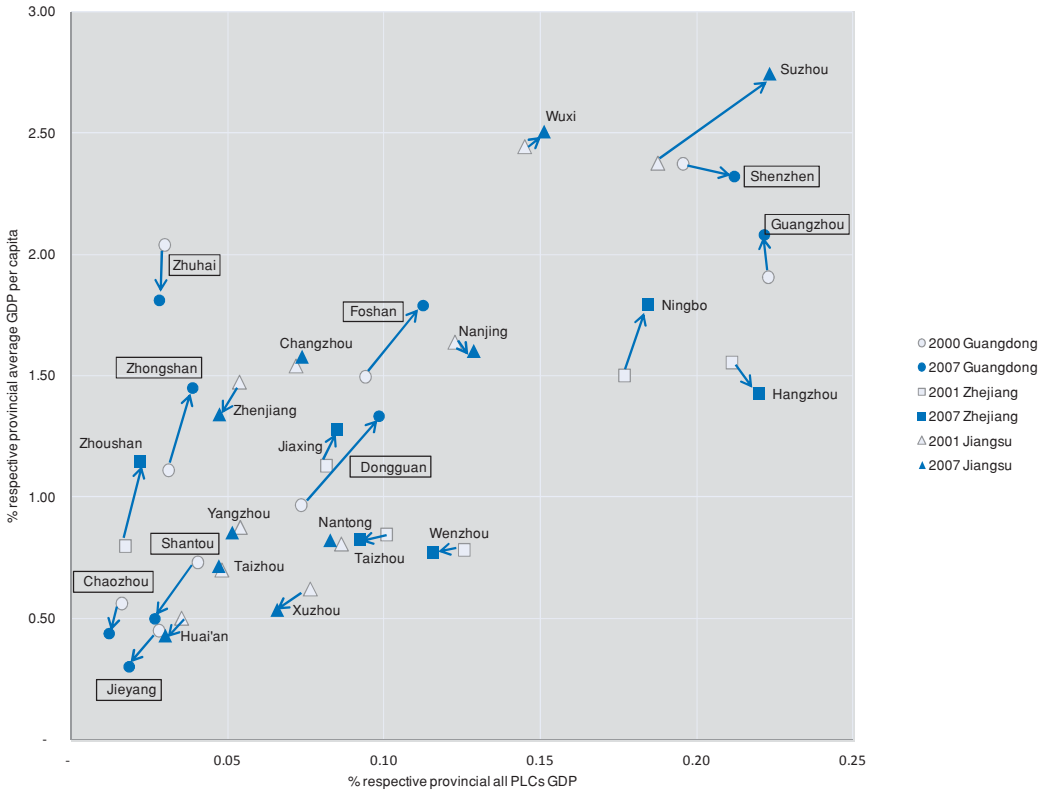
Urban development: Following designation as an SEZ, Shenzhen's size and population grew steadily. Local development centred on Luohu, the area closest to the railway station neighbouring Hong Kong, China. The first development phase of the SEZ was designed to develop the urban centre; during the first years Shenzhen grew 12 sqaure kilometres per year. The foundations of more than 300 skyscrapers were built, almost competing with Hong Kong, China (Inaba et al., 2001). Between 1980 and 1982, the population grew from 300 000 to 800 000 and temporary residents began to outnumber permanent residents. Shenzhen's economic development also benefited from being designated by the Chinese Committee for Scientific and Technological Modernisation as a "laboratory" to explore the management of private firms, the identification of new technological and scientific trends and the definition of new techniques to be applied in the construction sector.

In 1984, Shenzhen started its second development phase and the SEZ doubled to 122 square kilometres. When the population surpassed 1 million (800 000 permanent and 300 000 floating workers), the government authorities officially recognised the temporary population for the first time (Inaba et al., 2001). In 1989, as the population reached 1.5 million, and the SEZ reached 150 square kilometres, Shenzhen once again benefited from economic experimentation and became the officially recognised laboratory for the real estate market in communist China. Hong Kong, China became the official reference model for Shenzhen development allowing policy makers and urban planners to experiment with other urban paradigms, such as Singapore and New York. In subsequent years, the word "plan" was replaced by "prevision", proving the unpredictability of Shenzhen development within a free market context. During the 1990s, 6 new development zones were established, surrounding the city of Shenzhen (see Table 2.3); in 1996 the Shenzhen urban area accounted for about 3.5 million inhabitants, growing up to 10.8 million in 2007 (8.6 million permanent residents and about 2.2 million temporary residents) (Jin, 2007; NBS China database).

Economic development: Shenzhen has experienced one of the most rapid development rates in all of China, with a yearly growth rate of 17.3% in 2004 (against 12.2% in Guangdong and 7.9% in China). Furthermore, Shenzhen has the highest per capita GDP in the province: CNY 79 645 in 2007, about USD 11 653 (Jin, 2007; NBS China database). Being a SEZ, the industrial activity of Shenzhen is strongly oriented towards exports. Its industrial output is the highest among all provincial cities in Guangdong and in 2004 exports amounted to USD 77.8 billion. In 2005, FDI reached USD 2.3 billion more than 90% of which was concentrated in manufacturing activities. The share of high tech firms in Shenzhen's economy is increasing. Several multinationals operating in technology-intensive sectors have established their branches in Shenzhen, such as, IBM, Intel, Siemens, Samsung and Hitachi. The SEZ is also an important base for software development. The city produces about 20% of China's computers, 15% of semiconductor integrated circuits and it ranks first in sales of printers and liquid crystal displays (NBS China database). In order to further strengthen capacity to attract multinationals, heavy investments have been made in infrastructure and the area now has a modern transport system, including the urban metro system, the Guangzhou-Shenzhen Express, the Shenzhen-Shantou and Shenzhen-Huizhou national highways, the Yantian Port (the 2nd largest in the country for container shipment), the Bao'an International Airport (ranking 4th at the national level) and about 12 border checkpoints (Jin, 2007).

Political development: Finally, the political independence of the area has been strengthened. In 2004 Shenzhen reduced the role played by the government in microeconomics, creating government departments that are independent from national ministries. Also thanks to this administrative independence, for the first time the network of industrial relations appears to be more horizontally structured, e.g. with more relations among firms and less hierarchical control from the bureaucratic level.

Figure 2.14. **Change in GDP and GDP per capita share for prefecture-level cities (predominantly urban), 2001-2007**

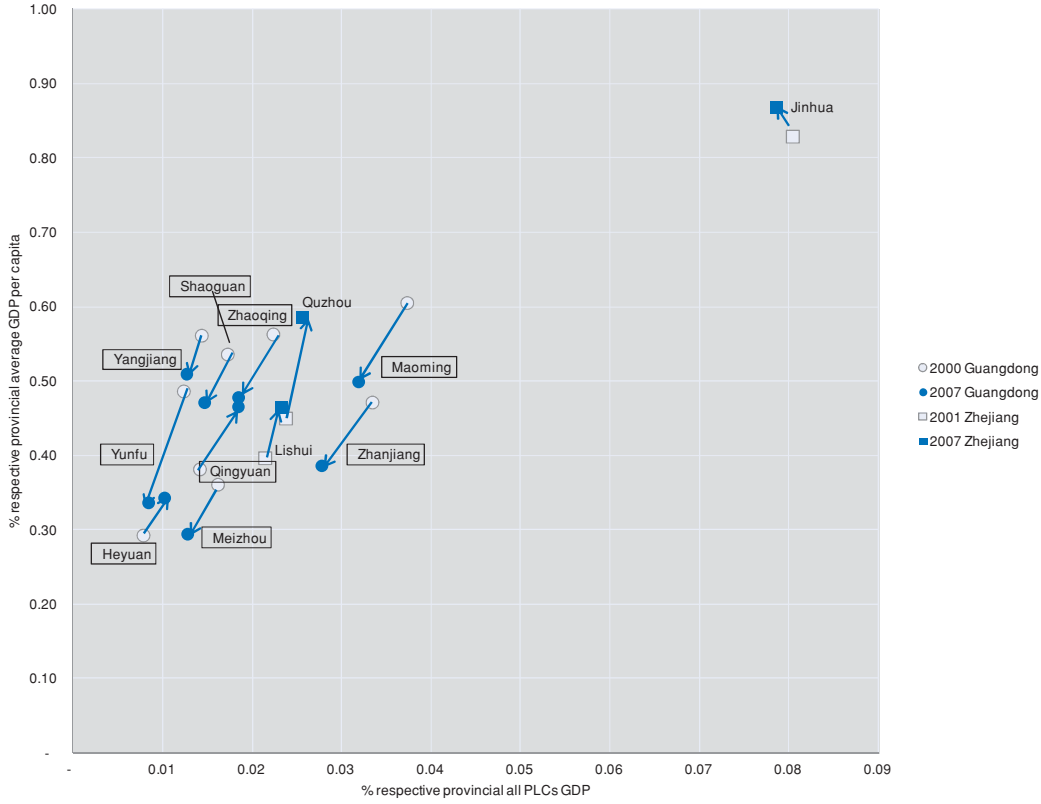


Note: Guangdong PLCs are highlighted in borders.

Source: CEIC database, *www.ceicdata.com*.

Figure 2.15. **Change in GDP and GDP per capita share for prefecture-level cities (predominantly rural), 2001-2007**

Comparison between Guangdong, Zhejiang and Jiangsu provinces

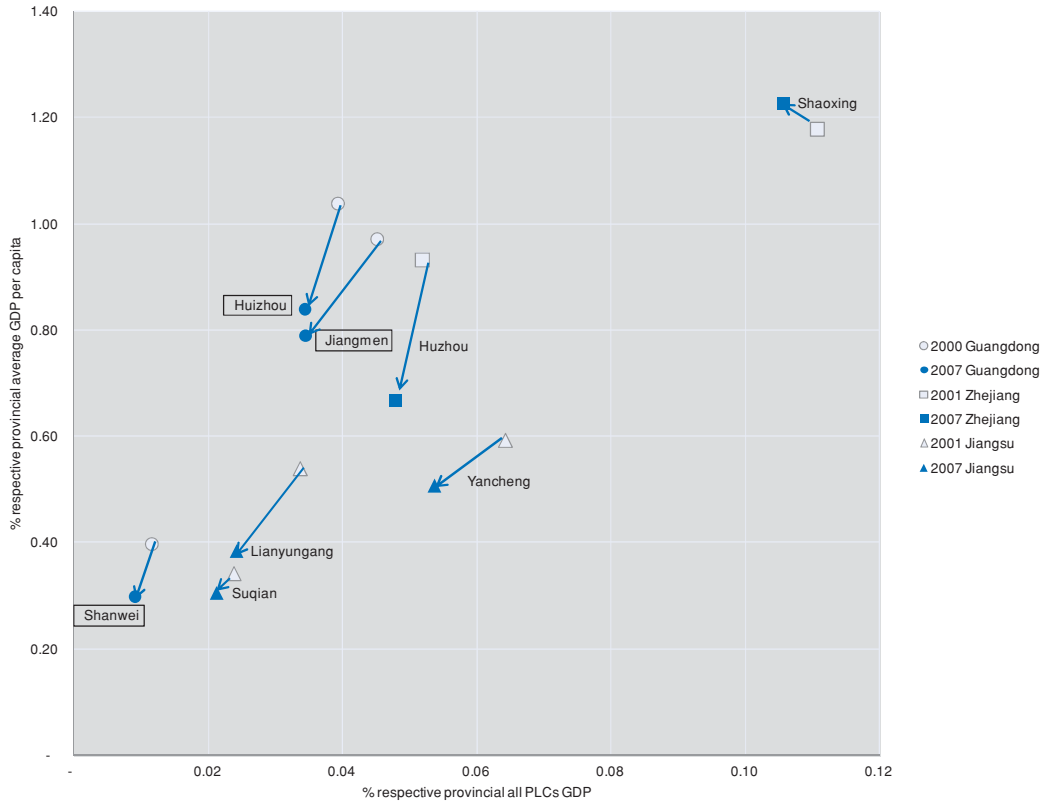


Notes: No PLCs in Jiangsu are classified as PR. Guangdong PLCs are highlighted in borders.

Source: CEIC database, *www.ceicdata.com*.

Figure 2.16. **Change in GDP and GDP per capita share for prefecture-level cities (intermediate), 2001-2007**

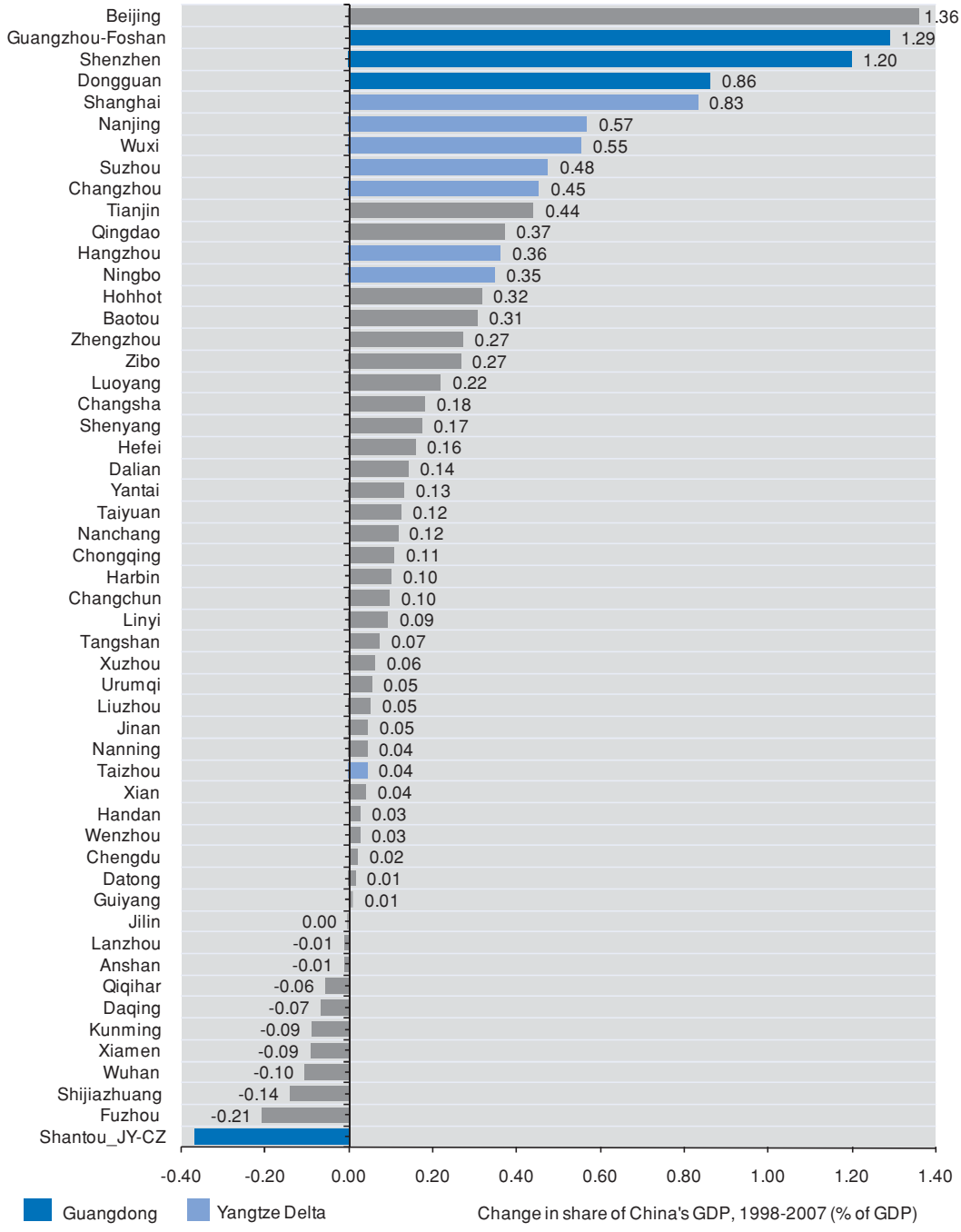
Comparison between Guangdong, Zhejiang and Jiangsu provinces



Source: CEIC database, www.ceicdata.com.

Concerning the performance of predominantly urban areas (PU), Guangdong's prosperity dramatically diminishes beyond its principal Inner PRD cities. Foshan, Guangzhou and Shenzhen contributed more than half of Guangdong's GDP in 2007 (Figure 2.17). Over 2000-2007, Shenzhen's contribution to the provincial economy grew dramatically, almost catching up to Guangzhou. Also, Shenzhen's GDP per capita has remained almost more than twice the provincial average, the highest in Guangdong and China. This reflects the shift to higher value-added manufacturing and producer services in Shenzhen. Guangzhou has registered GDP per capita growth, reflecting its growing heavy industry sector, especially in the automobile industry from Japanese investors. Shares of GDP and GDP per capita only declined in Zhuhai in the Inner PRD. Significantly, three other PU regions (Chaozhou, Shantou, Jieyang) experienced decline in both share of GDP and GDP per capita relative to provincial average (Figure 2.14).

Figure 2.17. **Changes in metropolitan regions' share of China's GDP, 1997-2007**



Source: Kamal-Chaoui, L., E. Leman and R. Zhang (2009), "Urban Trends and Policies in China", *OECD Regional Development Working Paper*, 2009/1, OECD Publishing, Paris.

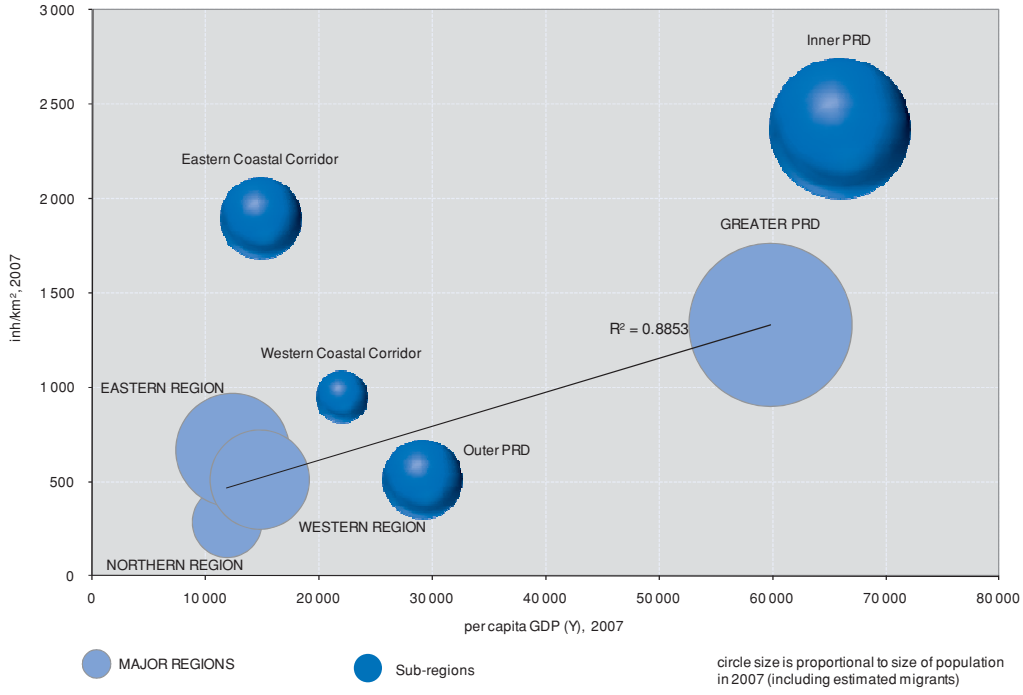
Predominantly rural and intermediate regions have been lagging and underperforming; however, there are well-performing rural regions. Heyuan and Qingyuan PLCs for instance experienced growth in both share of GDP and GDP per capita relative to the provincial average (Figure 2.15). Importantly, these two are rural regions (PR) located in the lagging North Guangdong. Both PLCs have built their success in industrial activities, particularly in heavy industry (steel rolling and machining), and attracting industrial investments relocating out of the Inner PRD. In other parts of Guangdong, rural areas have not benefited from foreign investment and suffered from out migration to urban areas.

Many migrant workers in Guangdong come from major provinces with high levels of out-migration, such as Hunan and Sichuan. In addition, internal migrants come from non-PRD rural areas of the province. The continuation of out-migration from rural areas in Guangdong has resulted in a series of problems, including a shortage of young labour and an increasing number of elderly people (OECD, 2009f; Xiang, 2005).[12] As migrants are discouraged from bringing their families to the cities (despite gradual steps to reform the *hukou* registration system), a disproportionate percentage of children remain in rural areas. The absence of parents creates additional challenges for the education of these so-called left-behind children.

Whilst agglomeration benefits have been exploited in the PRD region, the effects could not be realised in some other urban clusters nor are they automatic and durable within the PRD. In Guangdong, population size and density appear to be important generators of agglomeration economies (Figure 2.18). The Pearl River Delta, with half of Guangdong's population living and working at the highest densities, has the province's highest per capita GDP. The smaller, less dense regions have significantly lower levels of prosperity. However, there are limits to agglomeration economies: diseconomies of agglomeration can emerge due to congestion costs, and the lack of interactions between firms and labour skills that prevent the formation of a pool labour system. In Guangdong, plots of the four sub-regions are not consistent with agglomeration theory: while the Inner PRD has a large population, high density, and high per capita GDP, the three remaining sub-regions are not consistent with this pattern. At the metropolitan scale, while three of Guangdong's metropolitan regions (Dongguan, GuangFo and Shenzhen) have recorded top ranking in GDP growth, the Shantou-Jieyang-Chaozhou urban cluster appears to be at the bottom (Figure 2.17). This raises several questions: Why does the Eastern Coastal Corridor, with a population size equivalent to Ile de France – living and working at densities 80% of those in the Inner PRD – have the lowest per capita GDP? What is holding back the Western Coastal Corridor from reaping its coastal and geographic advantages? Why does the Outer PRD, with a population equivalent to Istanbul's have less than half the per capita GDP of the immediately adjacent Inner PRD? How can the Northern Region develop a sub-regional core that attracts people and firms? Two main trends can be observed in Guangdong:

- the absence of agglomeration economies in three of the four sub-regions;
- the diseconomies of agglomeration including within the PRD.

Figure 2.18. **GDP per capita and density among Guangdong's sub-regions**



Source: Guangdong Bureau of Statistics database, www.gdstats.gov.cn/tjnj/ml_e.htm; Hong Kong Census and Statistics Department database, www.censtatd.gov.hk; Macao Statistics and Census Service database, www.dsec.gov.mo.

There are weaknesses hampering production capacities, including in market access, innovation and human capital. The potential benefits of agglomeration economies linked with the concentration of skills and firms have limited impacts given these structural weaknesses.

2.2. Structural weaknesses to be addressed

In Guangdong, competitiveness is driven by four major factors, which determine a region's ability to attract inward investment of human, financial, and technological capital. These drivers are defined as follows:

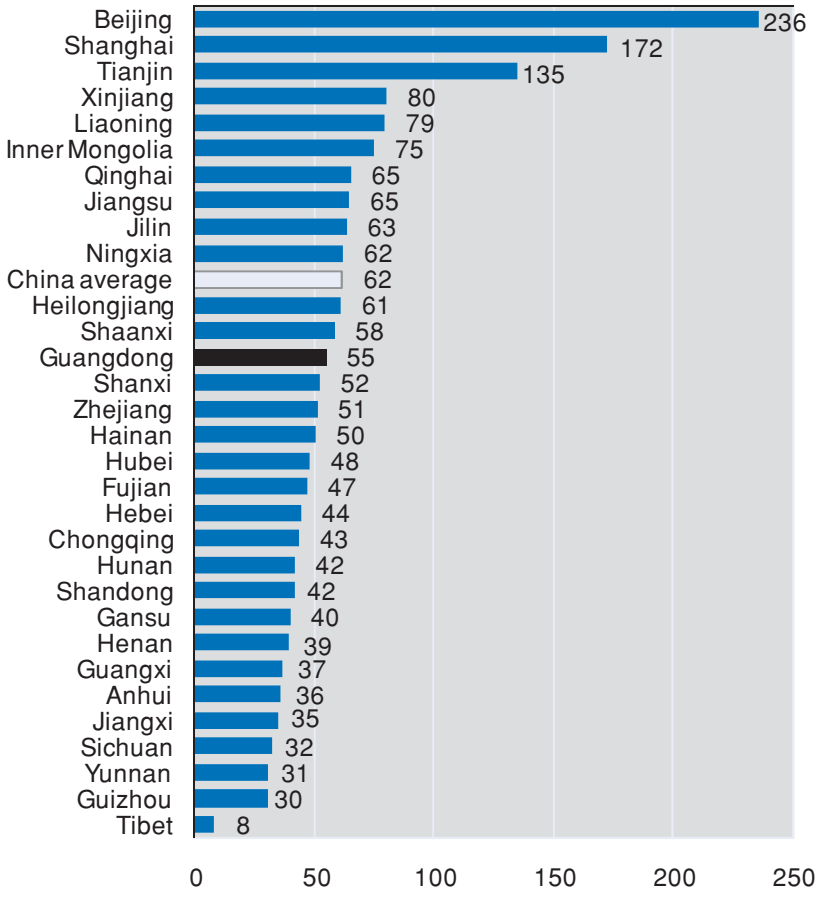
- **Production capacity** depends on the availability, quality and cost of factor inputs; how enterprises are organised and managed; property rights; technologies that firms apply to management, production and distribution; and accessibility to financing. Firms need to ensure that factor inputs are available and accessible (see Section 2.1).
- **Human capital** refers to the labour market, which must meet the demands of industrial production. This driver plays a strong role in determining innovation output.

- **Market access**, in the infrastructure category, concerns the ability of firms to actually provide goods and services, including access to input and output markets. Market access depends as well on the regulatory framework surrounding trade movements at the national, local and international levels.
- **Innovation capacity** is essential to firms' competitiveness for the simple reason that someone, somewhere is developing the same or similar products, services or distribution systems that meet customer needs at a lower price, or that respond to future market needs that are not yet obvious to competitors. Innovation capacity is the ability of a firm to respond to market needs more quickly and efficiently.

Human capital

Human capital is probably one of the most important challenges for Guangdong to tackle if it wants to move up in the value chain. Experience in OECD member countries clearly shows that the strength of human capital is the most important factor for regional competitiveness (OECD, 2009d). Education has become a high priority for both Chinese central and provincial governments since 2000, and considerable investment has been made in – and policy attention given to– all levels of education. For instance, the province of Guangdong increased its spending on education as a percentage of total government expenditure from 11.7% in 1999 to 18.2% in 2007, although education spending declined between 1994 and 1999 (from 14% to 11.7%). As a result, enrolment rates have grown significantly across the country in primary, secondary, and tertiary institutions. However, the province still faces important weaknesses in terms of advanced human capital. A 1% sample survey conducted by the National Bureau of Statistics shows that the number of people with college and higher education in Guangdong is 55 per 1 000 inhabitants, which is much lower than the Chinese average (62/1 000) (Figure 2.19). The percentage of Guangdong residents with a secondary education[13] (145/1 000) is higher than the national average (121/1 000) yet lower than Beijing (242/1 000), Shanghai (240/1 000) and Tianjin (202/1 000) (Figure 2.20). Therefore, although Guangdong has an abundant supply of qualified human capital to work in labour-intensive industries, the province seems to lack sufficient advanced human capital to engage in higher value-added industries. This may make Guangdong less attractive to higher value-added firms making location choices.

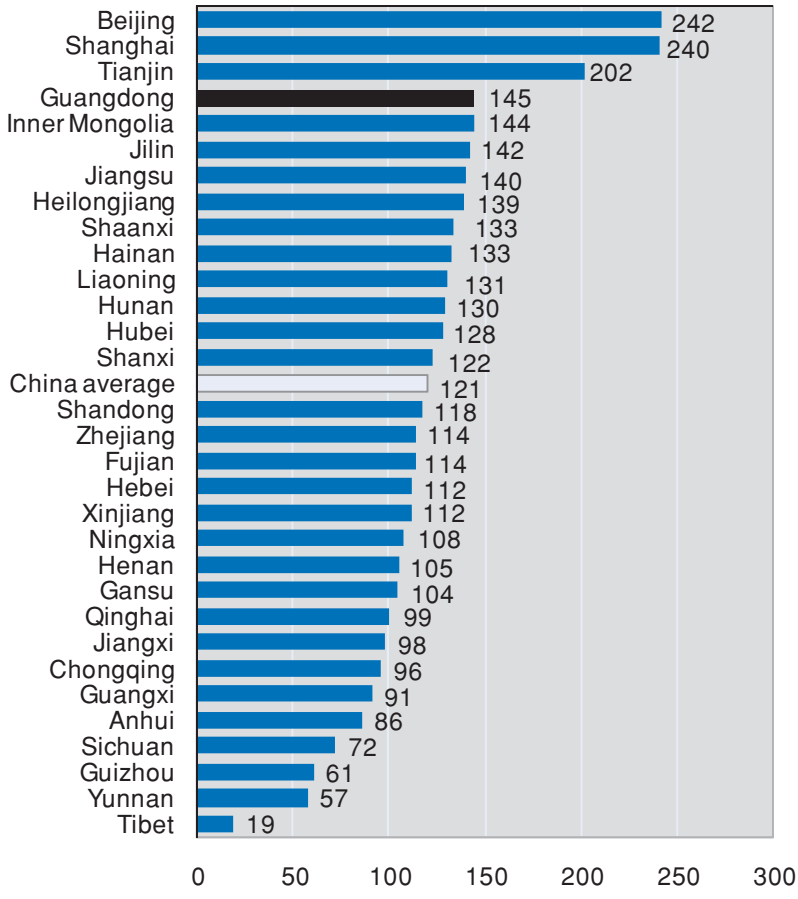
Figure 2.19. **Number of people with college and higher education per thousand inhabitants, 2005**



Note: Data are from year 2005 a 1% sample survey.

Source: National Bureau of Statistics of China database, *www.stats.gov.cn/english/statisticaldata/yearlydata*; *CEIC database*, *www.ceicdata.com*.

Figure 2.20. **Number of people with secondary education per thousand inhabitants, 2005**



Note: Data are from 2005 a 1% sample survey.

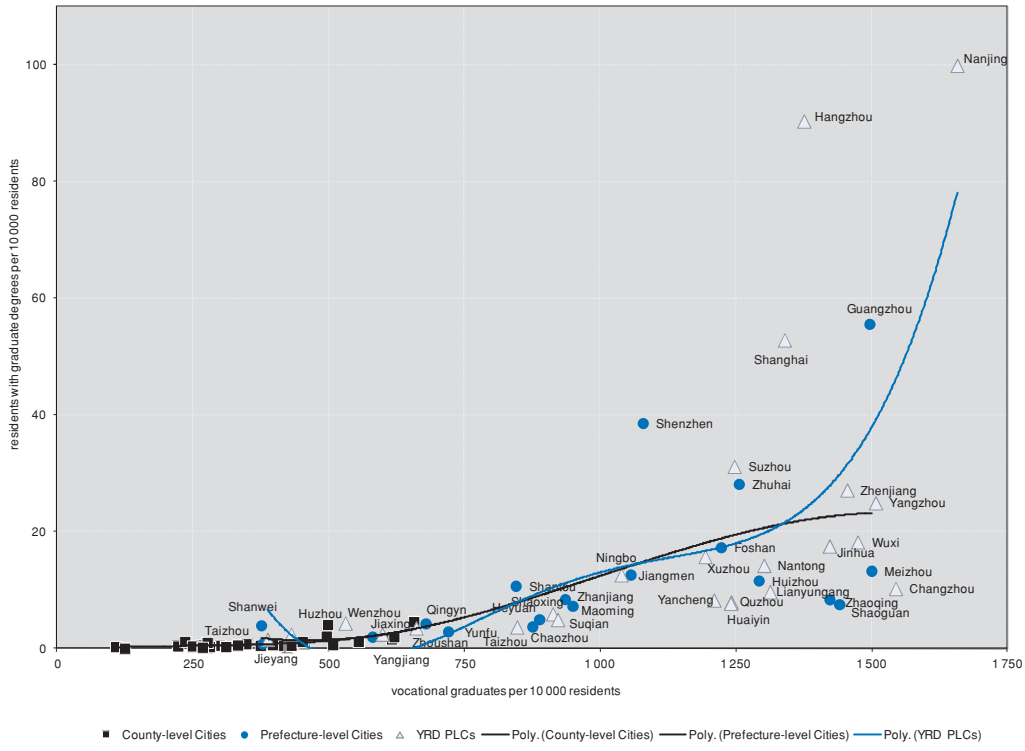
Source: National Bureau of Statistics of China database, *www.stats.gov.cn/english/statisticaldata/yearlydata*; *CEIC database*, *www.ceicdata.com*.

Within the province, there are huge differences in both vocational training and university education attainment. The 2000 National Census of China points out that county-level cities in Guangdong have very low vocational education attainment rates, suggesting that they will be hard-pressed to attract medium value-added industries.[14] There is a considerable range in vocational capacities among the 21 PLCs. Guangzhou, Meizhou, Zhaoqing and Shaoguan had the highest rates in 2000, reflecting the presence of vocational training capacities dating back to the centrally planned economy. Zhuhai, Huizhou, Foshan, Shenzhen and Jiangmen had relatively high attainment rates. Interestingly, these are non-traditional, newer industrial cities, and their high vocational rates suggest that they are either responding through their educational systems to demands for higher skilled labour, or that they are attracting more skilled workers from other parts of the province and elsewhere in China.[15] Vocational attainment rates diminish markedly in the other PLCs with Shanwei and Jieyang in the Western Region having the lowest rates in Guangdong (Figure 2.21). University education attainment rates also highlight important internal differences. University graduation rates are extremely low in county-level cities. The highest concentrations are, unsurprisingly, in the larger

metropolitan areas of Guangzhou and Shenzhen, followed by Zhuhai. Rates in remaining PLCs drop from just under 20% in Foshan to virtually 0% in Jieyang. Knowledge-intensive industries and services are not likely to be attracted to cities other than Guangzhou and Shenzhen.

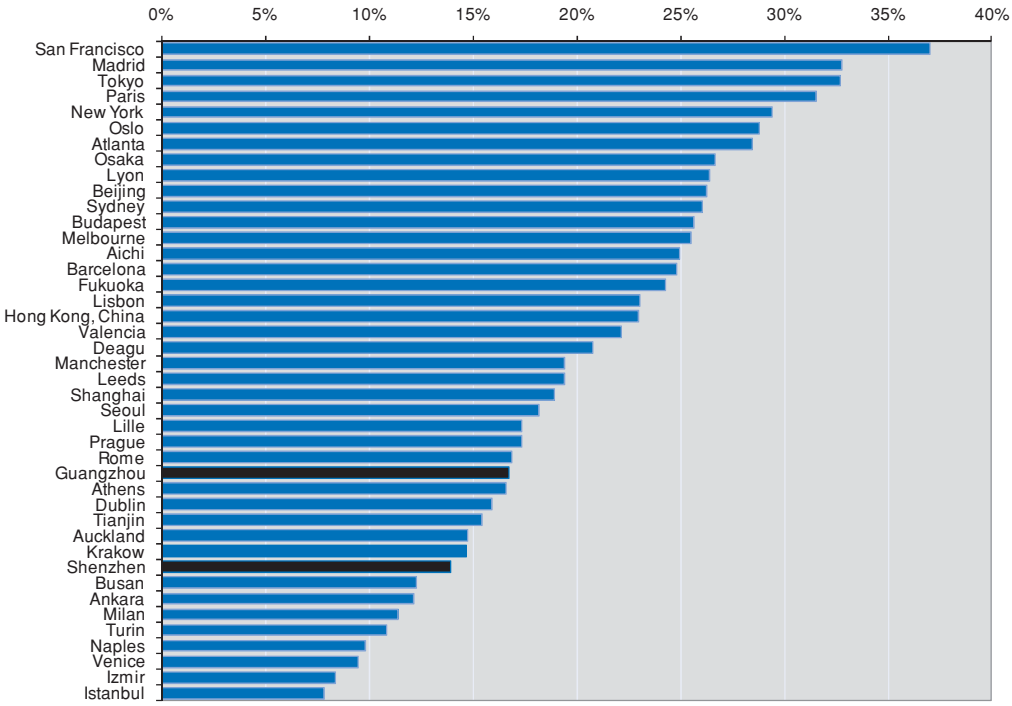
It is likely that higher value-added industries are concentrated in the Yangtze River Delta because both vocational and university attainment rates are considerably higher than in Guangdong. The relatively higher rates in Guangzhou (16.8%) and Shenzhen (14.0%) were lower than advanced Chinese cities like Beijing and Shanghai, and were also in the lower section when compared with OECD metro-regions (Figure 2.22). Nearby Hong Kong, China marked the median ranking position, yet much higher than that of Guangzhou and Shenzhen. Addressing the differences in human capital between Guangzhou/Shenzhen and the Beijing/Shanghai should be a top priority for the Guangdong provincial government if the province is to attain competitive capacities in restructuring towards higher value-added industries. Whilst Guangdong's industries, especially in the PRD, have historically attracted migrant workers from across the province and numerous other provinces, migration rates have declined since 2005, leading to a labour shortage that emerged in 2004. Migrants increasingly prefer working in the Yangtze River Delta and large cities in other provinces. Recent surveys suggest that the principal reasons are: *i*) higher net earnings in the YRD; *ii*) fewer discretionary fees and exactions charged by local governments; *iii*) better treatment from employers; and *iv*) a wider range of employment options (Study Group of Ministry of Labour and Social Security, 2004). The PRD's migrant workers from other provinces are generally well educated and skilled. In the early part of this decade, the year 2000 National Census showed that many had higher educational attainment than local residents. The proportions of migrant workers with education at higher secondary/technical school and above were much higher than those of non-migrants (Shen, 2007). The shifting of this valuable pool of human capital to other regions in China is a worrisome trend, especially given the comparatively lower level of attainment in Guangdong's permanent resident population.

Figure 2.21. **Educational attainment levels in Guangdong cities and Yangtze River Delta cities, 2000**



Source: Calculated from 2000 National Census of China, *www.stats.gov.cn/tjsj/pcsj/rkpc/dwcrkpc*.

Figure 2.22. **Tertiary education of population (over age 15) in a sample of OECD metro-regions and Chinese cities, 2005**



Note: Chinese cities are the whole prefectures or provincial-level municipalities. Data for mainland China cities are from a 2005 1% sample survey; Hong Kong, China data are from the 2006 population census.

Source: *OECD Metropolitan database, http://stats.oecd.org/Index.aspx?datasetcode=METRO*; *National Bureau of Statistics of China database*, *www.stats.gov.cn/english/statisticaldata/yearlydata*.

Accessibility to markets

Transportation network

One of the main foundations of Guangdong's economic growth over the last two decades has been globally competitive transport costs for firms serving export markets, largely from the eastern portion of the Inner PRD where major container ports have been built over the last 30 years. As the provincial economy restructures to increasingly serve China's growing domestic market, competitive access to dense markets across the GPRD, along the country's coast (Yangtze Delta and Bohai Gulf in particular), and inland (especially in the central and western Yangtze Basin regions) will become essential. In order to serve both domestic and international markets, two modes of transport are of particular importance:

Port infrastructure: Guangdong's coastal location has been pivotal to its economic growth over the last 30 years. The PRD in particular has benefited greatly from an extensive port infrastructure, initially in Hong Kong, China, and more recently in Shenzhen and Guangzhou.

Road networks: Accessibility by road is critical in Guangdong for the movement of raw materials and manufactured inputs to industries, for the shipment of outputs to logistics hubs, air cargo terminals, and coastal container ports in Shenzhen, Guangzhou and Hong Kong, China (which serve both domestic and export markets), for the movement of workers to places of work, and for knowledge exchange.

In addition to port and road networks, **rail transport** still provides limited contribution for moving Guangdong's outputs. Guangdong's rail transport system is geared to the movement of bulk commodities, particularly coal. There is no containerised rail transport in Guangdong, or elsewhere in China. Rail accounted for 8% of freight ton-kilometres in Guangdong in 2007, compared with 21% for highways and 71% for waterways (*NBS China database*).

Analysis of the transportation network in Guangdong highlights major improvements and significant challenges, including a development pattern still concentrated on the PRD, in contrast with the Yangtze River Delta which benefits from better access to input and output markets.

Port infrastructure

Combined with ports in Hong Kong, China and Macao, China, the Greater Pearl River Delta has the largest port capacity in China, and across Asia. It includes:

- **Hong Kong, China's container port at Kwai Tsing** which currently has a capacity of 18 million twenty-foot equivalent units (TEUs). Expansion plans advised by the Hong Kong Port Development Council call for an increase in capacity to 26.1 million TEUs by 2020.
- **In the eastern part of Shenzhen at Yantian,** a container port was completed in 1994 in partnership with one of Hong Kong, China's major port operators. It currently has a capacity of 10.9 million TEUs which is planned to increase to 17.5 million by 2021.
- **In western Shenzhen, the port at Shekou** is predominantly for bulk cargo, with a capacity of 15 million tons per year. However, a new western container port is being developed at **Dachan Bay** just south of the Shenzhen airport; current capacity is 2.5 million TEUs with a planned capacity of 10 million TEUs by 2020. A smaller container port at **Chiwan, south of Dachan Bay in Shekou**, has a capacity of 4 million TEUs.
- To the north, **Guangzhou opened a container terminal in Nansha** in 2004 with a capacity of 7 million TEUs. Smaller container ports also operate from both Zhuhai and Macao, China.

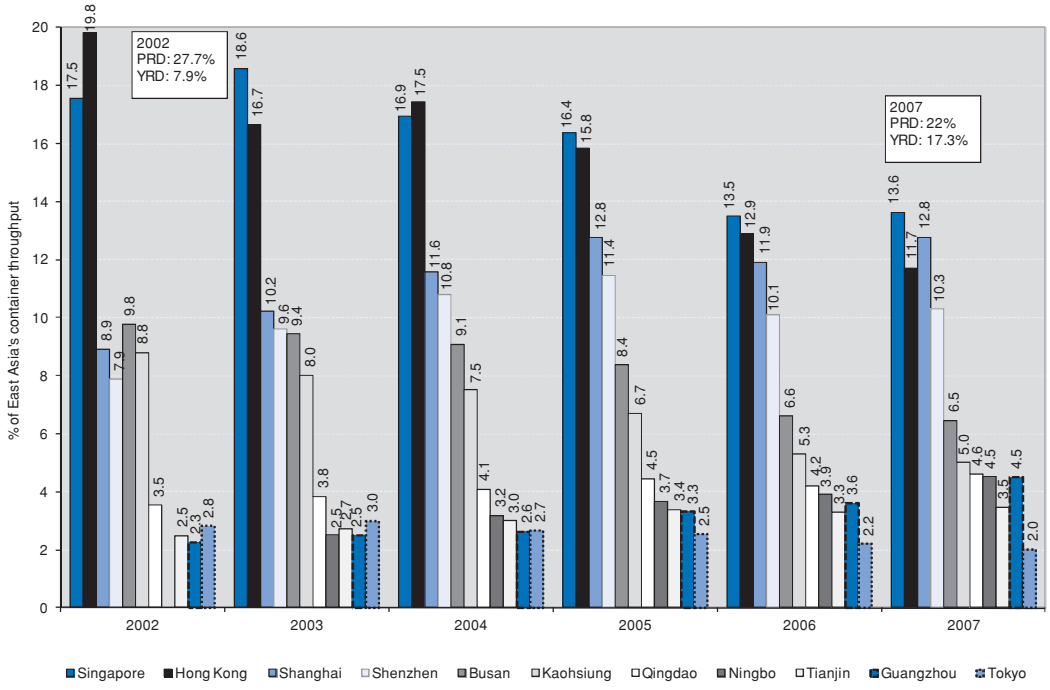
This port cluster provides Guangdong with extensive access to global markets and underpins the PRD's dominant orientation to export processing.

Yet, a major expansion of container port facilities occurred since the late 1990s in the Yangtze River Delta, focusing on Shanghai and Ningbo. The first phase of Shanghai's Yangshan container port began operating in 2005; when completed in 2013, the port will be the largest in the world. Extensive expansions to Ningbo's port are also underway. This expansion of capacity in Shanghai and Ningbo, coupled with the surge in imports and exports from the YRD, is cutting into the market share of the PRD's ports. The YRD ports accounted for 7.9% of all of East Asia's container throughputs in 2002, compared to

27.7% for ports in the PRD (Figure 2.23). By 2007, the PRD's share of throughput had dropped to 22% while the YRD's share had risen sharply to 17.3%. By 2015 at the latest, the 2 ports in the YRD will likely overtake the 3 major ports in the PRD in share of East Asia's total container throughput.

Moreover, despite this massive growth in ports, Guangdong, and the PRD in particular, have only limited logistics services. In the PRD, advanced logistics services are concentrated in Hong Kong, China and in Shenzhen where over 2 000 companies offer some form of service (Hong Kong Trade Development Council – HKTDC, 2009). Shenzhen has 6 logistics parks and over 50 foreign companies including UPS, Maersk, FedEx, and Kerry Logistics, have registered in the city. MNCs such as Aeon, IBM and Wal-mart have established global or regional sourcing centres in Shenzhen. The provincial government of Guangdong recognises the need to spread logistics services across the PRD: during the 11th Five-Year Plan, CNY 103 billion will be invested in logistics facilities and related infrastructure.

Figure 2.23. **Shares of East Asia's combined container throughput, 2002-2007**



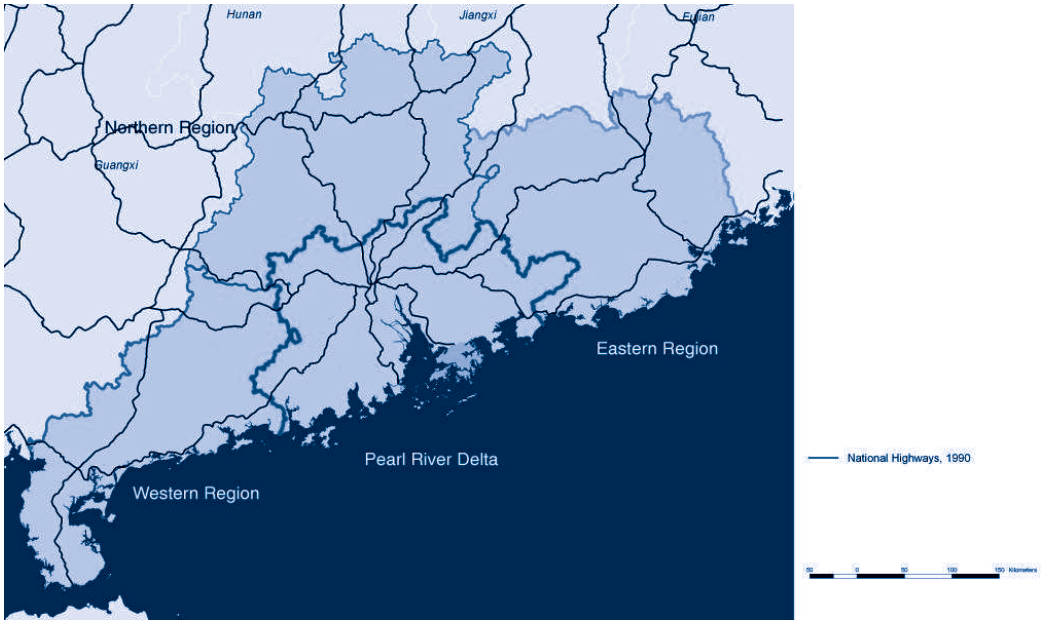
Source: Containerisation International annual port rankings, various years.

Roads

Guangdong has built a massive stock of expressways over the last two decades. There were no expressways in Guangdong in 1990 (Figure 2.24). At that time, the intercity road network was the 3603 kilometre-long "National Highway" system, most of which was developed since 1948. These roads were designated by the central government as having national strategic importance and were placed under its control. Despite this national designation, road quality varied from Class I (paved, minimum two-lane roads) to Class IV and below (narrow dirt or gravel roads).[16] In 1990, 19.5% of national highways in Guangdong were Class I, 62% were Class II, and 18.8% were Class III and below. From 1990 to 2009, 5 123 kilometres of expressways were built in Guangdong (Figure 2.25). In comparison, France – with a land area 3 times larger than Guangdong – built 3 134 kilometres of toll highways between 1978 and 1998 (Combes *et al.*, 2003: 12).

Figure 2.24. **National highways, 1990**

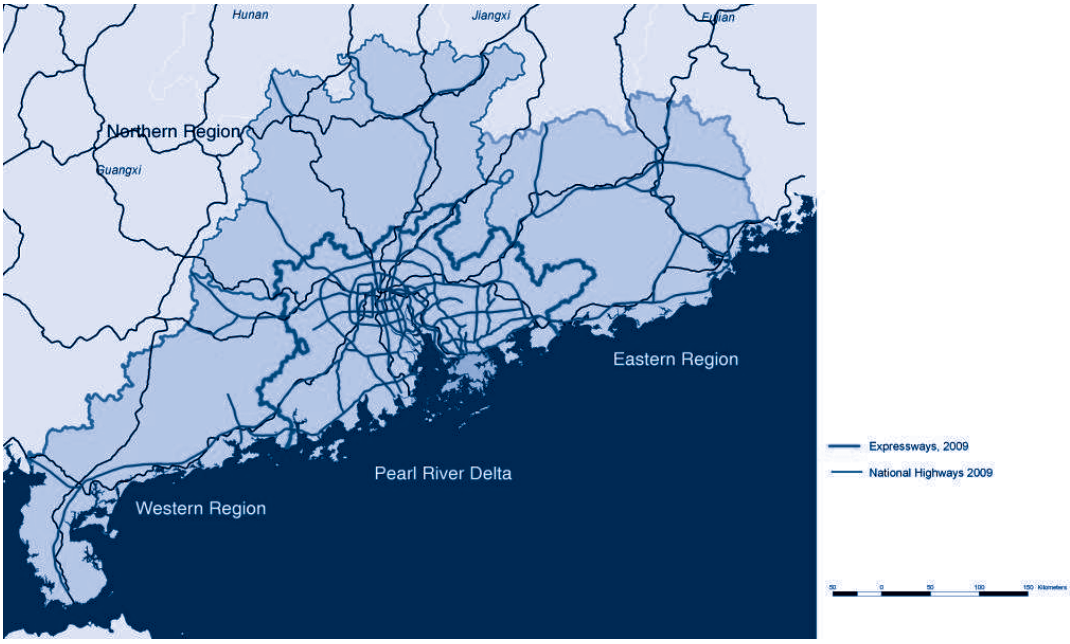
National highways: 3 603 kilometres, expressways: 0 kilometres



Source: Calculations based on data from the *OECD GIS database*, internal database and on Ministry of Communications data.

Figure 2.25. **Expressways and national highways, 2009**

National highways: 3 603 kilometres, expressways: 5 123 kilometres

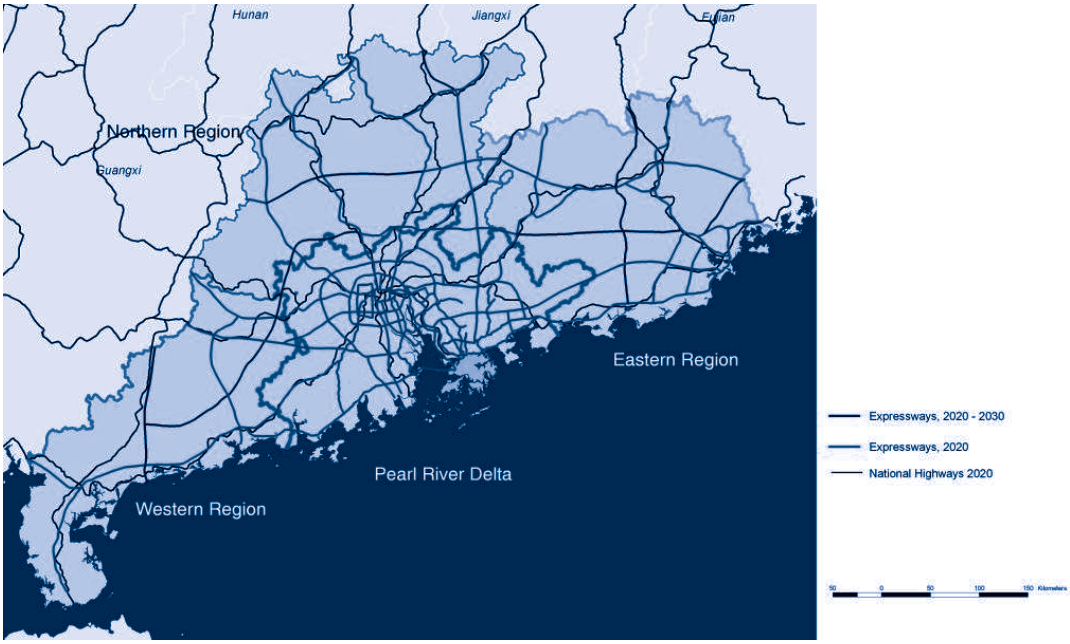


Source: Author's calculations based on data from the *OECD GIS database*, internal database and based on Ministry of Communications and Guangdong Provincial Development and Reform Commission.

Guangdong has ambitious plans to construct more expressways, extending to 2030. From 2010 to 2020, the provincial government of Guangdong plans to build an additional 1 410 kilometres of expressways. The focus of this investment programme will be on improving access to the peripheral regions, and to complete the National 7918 Highway System with strategic, national links (Figure 2.26). From 2020 to 2030, an additional 1 085 kilometres of expressways are planned, all of which will be in the peripheral Eastern, Northern, and Western Regions. By 2030, Guangdong will have 7 618 kilometres of expressways (Table 2.4). Much of the old 3 603 kilometre national highway network will be upgraded to Class I roads.[18]

Figure 2.26. **Expressways and national highways, 2020-2030**

National highways: 3 603 kilometres, expressways: 7 613 kilometres



Source: Calculations based on data from the *OECD GIS database*, internal database and on Ministry of Communications and Guangdong Provincial Development and Reform Commission data.

Table 2.4. **Length of national highways and expressways, 1990-2030**

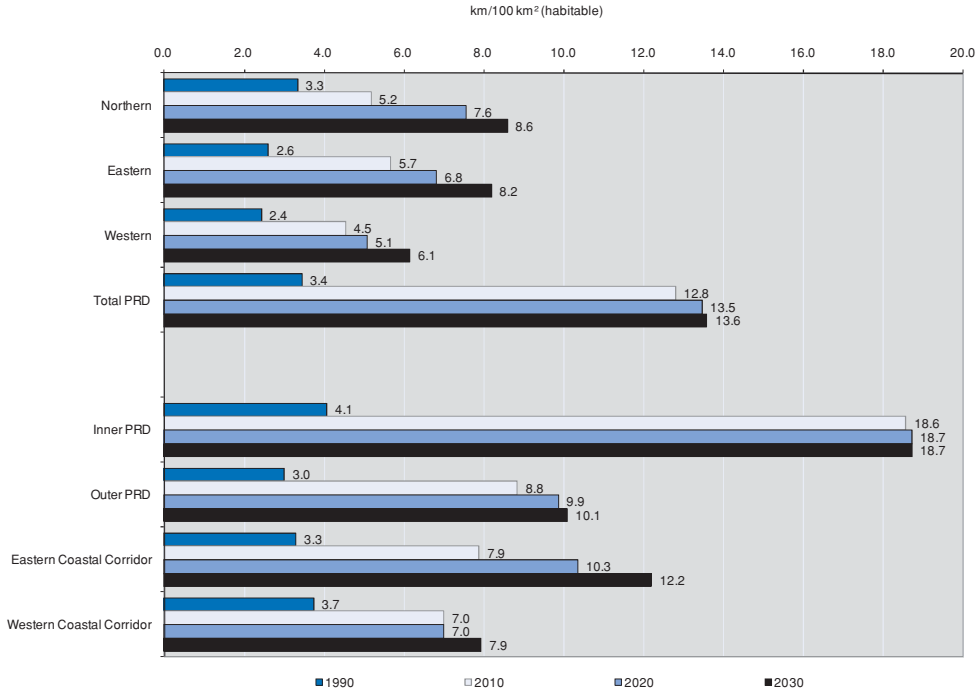
	Major regions					Sub-regions			
kilomtres of road	Northern	Eastern	Western	Total PRD	GD total	Inner PRD	Outer PRD	Eastern Coastal Corridor	Western Coastal Corridor
1990 (national highway), km	943	813	742	1 105	3 603	531	574	180	163
national highway in 1990	943	813	742	1 105	3 603	531	574	180	163
expressways in 1990	–	–	–	–	–	–	–	–	–
2010 (NH+expressway), km	1 461	1 769	1 387	4 109	8 726	2 421	1 688	430	305
national highway by 2010	943	813	742	1 105	3 603	531	574	180	163
expressways in total by 2010	518	956	645	3 004	5 123	1 890	1 114	250	142
2020 (NH+expressway), km	2 132	2 126	1 555	4 323	10 136	2 440	1 883	564	305
national highway by 2020	943	813	742	1 105	3 603	531	574	180	163
additional expressways constructed 2011-2020	671	357	168	214	1 410	19	195	134	
expressways total by 2020	1 189	1 313	813	3 218	6 533	1 909	1 309	384	142
2030 (NH+expressway), km	2 423	2 554	1 880	4 364	11 221	2 440	1 924	665	346
national highway by 2030	943	813	742	1 105	3 603	531	574	180	163
additional expressway constructed 2021-2030	291	428	325	41	1 085	–	41	101	41
expressway total by 2030	1 480	1 741	1 138	3 259	7 618	1 909	1 350	485	183

Note: Projections for 2020 and 2030 length figures are derived from the highways and expressways map in the official plan, using GIS-based calculations. The nuances of this approach mean that those projections may be slightly shorter than the lengths of road actually constructed.

Source: Author's GIS-based calculation using data from the Guangdong Provincial Government.

Despite huge investments, a large stock of expressways does not necessarily mean uniform improvements to accessibility across the province. In 1990, densities of high-speed roads[19] were generally uniform across Guangdong's regions and sub-regions:[20] the National Highway network served all areas relatively equally (Figure 2.27). However, while Guangdong's overall density of high-speed roads increased by 2.4 times from 1990 to 2009, regional and sub-regional densities diverged considerably. Although densities increased by 2.5 and 2.6 times in the Western and Northern Regions respectively, density grew by 3.2 times in the Eastern Region. Reflecting the concentration of investment in the PRD, road densities in the Delta quadrupled during this period. Moreover, almost 60% of Guangdong's new expressway stock has so far been concentrated in the PRD, mostly in the Inner PRD. Densities in 2009 in the Inner PRD are 4.6 times greater than in 1990. Significantly, densities in the Outer PRD (a 3.4 times increase) were less than in the Eastern Coastal Corridor which grew by 3.7 times. The smallest increase in effective road density was in the Western Coastal Corridor, one of the least developed areas in Guangdong.

Figure 2.27. **Densities of national highways and expressways, 1990-2030**



Source: Author's GIS-based calculation using data from the Guangdong Provincial Government.

The concentration of expressway investment in the Inner PRD mirrors the spatial focus of industrial investment, production intensities, and population densities in this strategic part of Guangdong over the last two decades. While sufficient data are not available to definitively establish a causal relationship, the improvements in accessibility across the Inner PRD – especially along its eastern flank – have clearly facilitated the emergence of agglomeration benefits that enabled this territory to become the most productive region in Guangdong. The opposite is likely true in Guangdong's other regions and sub-regions. As reviewed earlier, output per capita and productivity attenuate

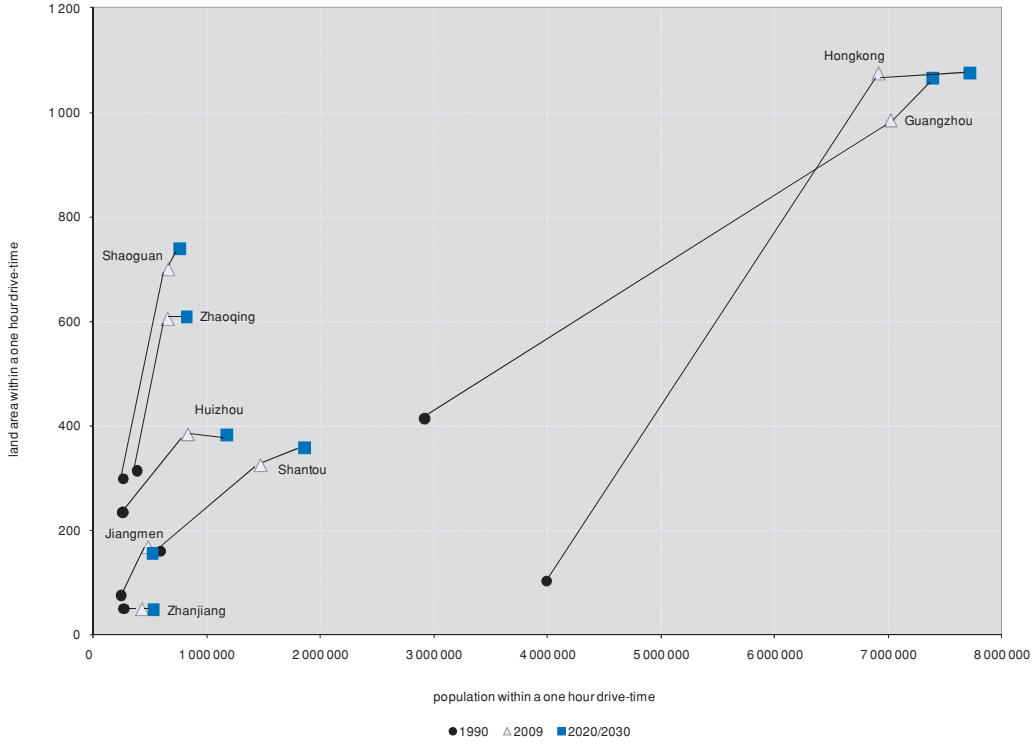
sharply with distance from the Inner PRD such that the far lower productivity levels in much of the Outer PRD are almost the same as in the province's peripheral regions. Relatively limited accessibility to logistics hubs and coastal container ports from these regions has meant that industrial investment – especially from Hong Kong, China and Chinese Taipei[21] – has concentrated in the far more accessible Inner PRD where generalised transport costs are lowest.

Expressways densities will not change appreciably in the Inner PRD under GDPG's Expressway Development Programme to 2030. Densities will increase somewhat in the Outer PRD to reach just over half of those in the Inner PRD. They will increase in the Northern and Eastern Regions – particularly in the Eastern Coastal Corridor – but will remain low in the Western Region. By the end of the Expressway Programme in 2030, the Inner PRD will still have – by far – the highest densities of high-speed roads in Guangdong.

A GIS-based accessibility analysis of Guangdong confirms that while road infrastructure improved markedly in the past 20 years and will further improve through 2020/2030, accessibility improvements of Guangdong's different strategic locations vary (see Annex A). More precisely, access to land area and labour market has been and will be improved differently, based on one-, two- and three-hour drive time analyses. Guangzhou has benefited the most from expressway construction in Guangdong from 1990 to 2009. Its one-hour consumer and labour sheds have grown enormously, suggesting that investment has been designed to benefit the provincial capital (Figure 2.28). Hong Kong, China has also significantly expanded its consumer and labour sheds, but from internal investments in a massive programme of expressway, bridge, and tunnel construction during this period that brought the entire population within a one-hour drive from the city's core area.

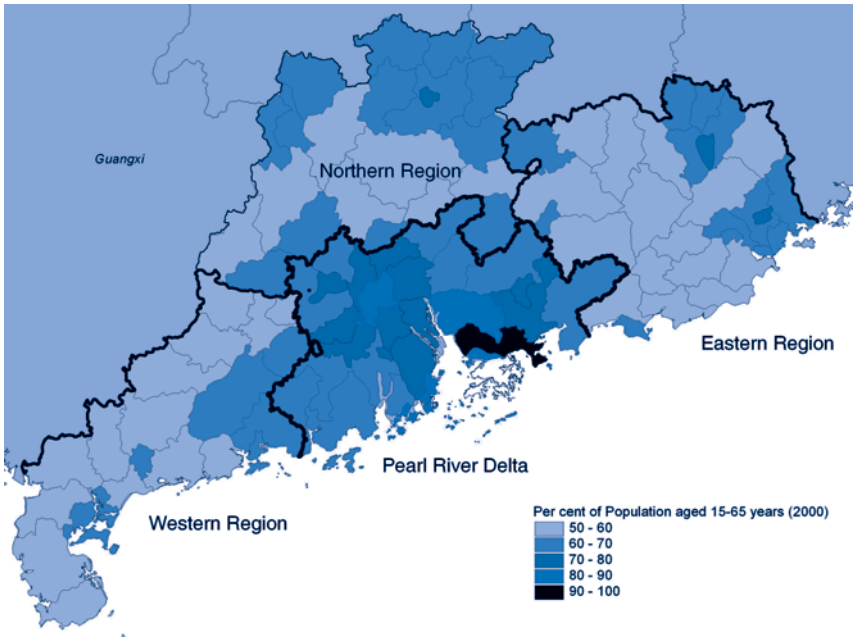
Although potential consumer markets have expanded with spatial extensions of one-hour drive-times, this expansion in cities beyond the PRD does not necessarily mean that their labour pools have increased appreciably. An important factor in analysing access to labour markets in Guangdong is the distribution of working age population (15-65 years of age). While current data on age structure at the county and city levels are not available,[22] data from the 2000 National Census suggest that there are large differences in labour pools across the province. The largest concentration – by far – of working-age residents, including migrant workers, is in the PRD[23] (Figure 2.29). Conversely, while both Shaoguan and Shantou have had major increases in the one-hour drive-time catchment area, stocks of population at working age are low beyond their city boundaries. In comparison, while Zhaoqing, Huizhou and, to a lesser extent, Jiangmen have also experienced significant increases in one-hour travel-time areas, the proportion of their populations of working age – at least in 2000 – were far higher.

Figure 2.28. **Changes in one-hour drive-time accessibility, 1990-2020/2030**



Source: GIS-based calculation using data from the Guangdong Provincial Government.

Figure 2.29. **Age activity rate in Guangdong, 2000**



Note: Age activity rate is the ratio between the working age population (aged 15-64) and the total population.

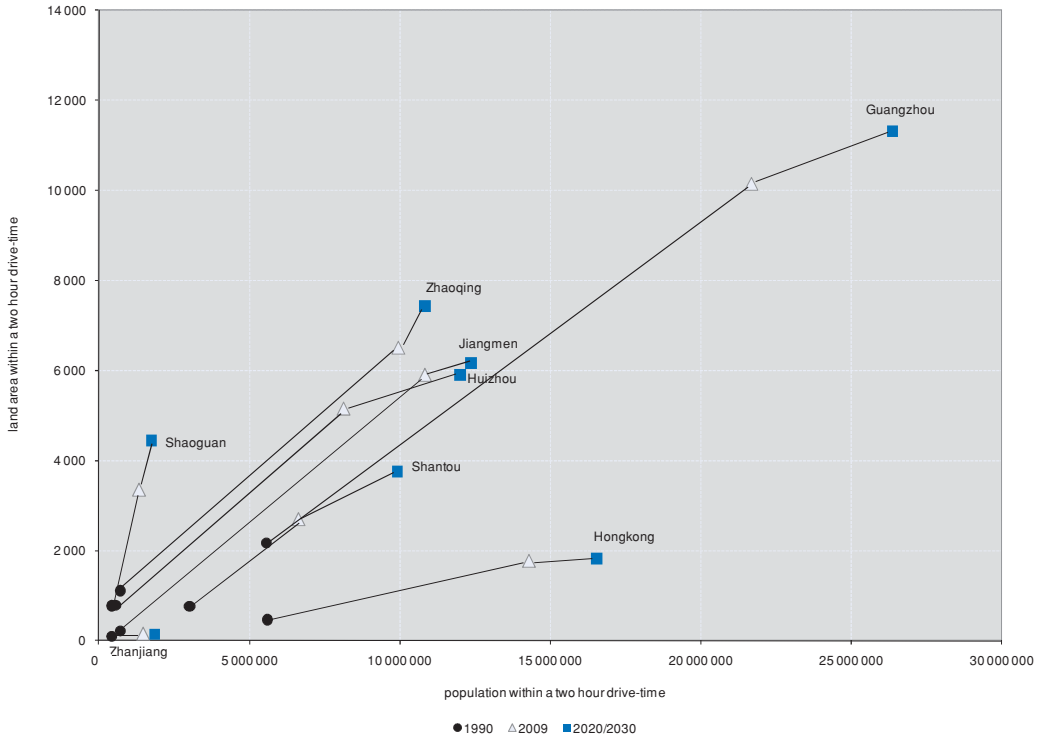
Source: Calculations based on data from the *OECD GIS database*, internal database and the 2000 National Census of China, *www.stats.gov.cn/tjsj/pcsj/rkpc/dwcrkpc*.

In terms of accessible locations for industries and access to wider input markets of raw materials and intermediate inputs, all cities – except for Zhanjiang in the Western Region – have seen improvements to two-hour drive-time catchment areas between 1990 and 2009. They will continue to do so, to varying degrees, but at a slower rate, until 2020/2030 (Figure 2.30). More precisely:

- Again, the biggest beneficiary has been Guangzhou, reflecting the capital-centric bias in provincial expressway planning.
- Hong Kong, China has not benefited as much as Guangzhou because of its location and border controls.
- Significantly, the three cities in the Outer PRD – Zhaoqing, Jiangmen, and Huizhou – rank second to Guangzhou as a group experiencing major accessibility improvements that, together with lower land-use costs, have increasingly made them competitive locations for low and medium value-added manufacturing relative to the Inner PRD. All three now have two-hour access to at least one of the PRD's major container ports in Guangzhou (Nansha) and Shenzhen.
- Shaoguan in the Northern Region and Shantou in the Eastern Region have had smaller extensions of their two-hour drive-time catchment areas but, in regional terms, these improvements are important. Shaoguan's location along China's principal north-south railway line means that its improved regional accessibility could expand access for regional suppliers to the country's domestic markets along the Yangtze Basin and along the Bohai Gulf. Shantou's expanded two-hour catchment area could similarly enhance its distribution hub role in the Eastern Region both for export and domestic markets. This hub role could gradually include the provision of higher value-added producer and logistics services. While most products from this region will be commodities shipped as bulk cargo either by rail to domestic markets or by ship, there could be increasing production of basic manufactured outputs that might provide the impetus to expand Shantou's limited container terminal facilities.

Improvements in accessibility within a three-hour drive-time show the same hierarchy of beneficiaries (Figure 2.31). Guangzhou again gains the most area and accessible population, followed by Zhaoqing, Huizhou, and Jiangmen. Shantou and Shaoguan again comprise the third tier. Particularly important, however, is the increased accessibility to cheaper industrial locations and input markets for Hong Kong, China resulting from the construction of the Hong Kong, China-Zhuhai-Macao, China Bridge that brings the western portion of the Inner PRD – and much of the Outer PRD – into its daily economic space. By 2020/2030, almost all of the Inner PRD and portions of the Outer PRD will be accessible in a day-long return trip from Hong Kong, China, and therefore accessible to the SAR's advanced container port at Kwai Tsing.

Figure 2.30. **Changes in two-hour drive-time accessibility, 1990-2020/2030**



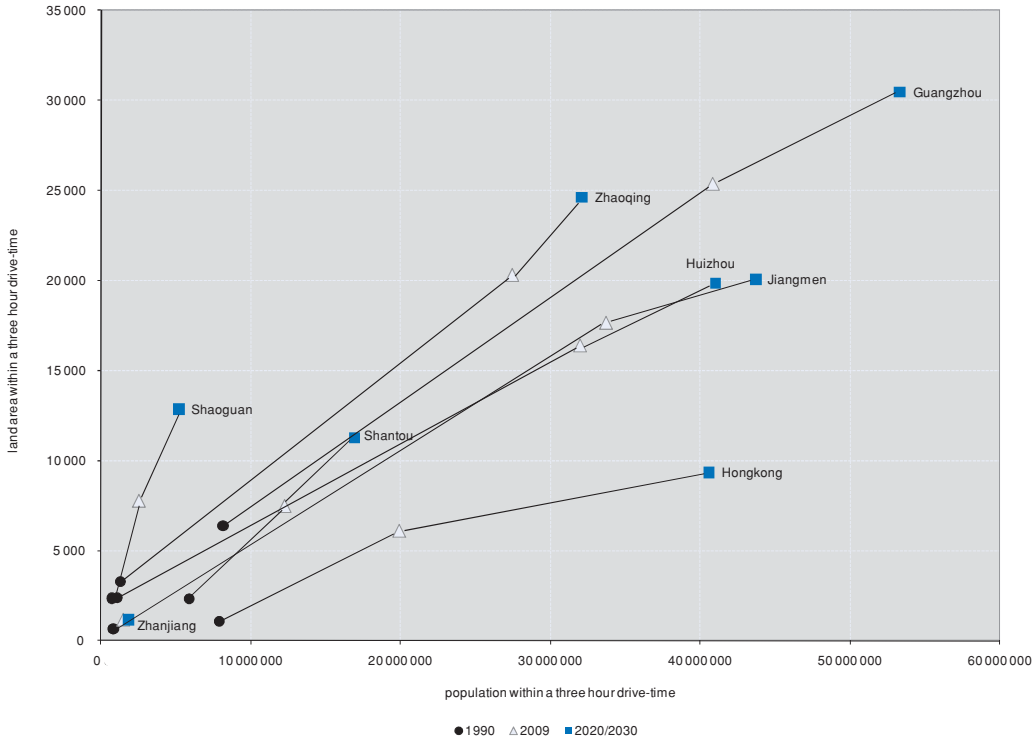
Source: Author's GIS-based calculation using data from the Guangdong Provincial Government.

A comparative accessibility analysis between Guangdong and the Yangtze River Delta highlights a number of advantages for the Yangtze River Delta. As mentioned previously, Guangdong's principal competitor in China is the Yangtze River Delta, principally Shanghai and 15 PLCs in Jiangsu and Zhejiang provinces. While non-farming productivity was the same in the mid-1990s, the YRD was 20% more productive than Guangdong in 2005. In 2003, the YRD overtook Guangdong in its share of China's external trade, and its lead continues to grow. While many factors have contributed to the YRD's increased competitiveness, access to input and output markets seems to have been a major contributor.[24]

Because of the pattern of population distribution and the geometry of the expressway network, strategic locations in the YRD are able to capture a far larger population and spatial territory in their one- and two-hour drive times than are cities in Guangdong. More specifically:

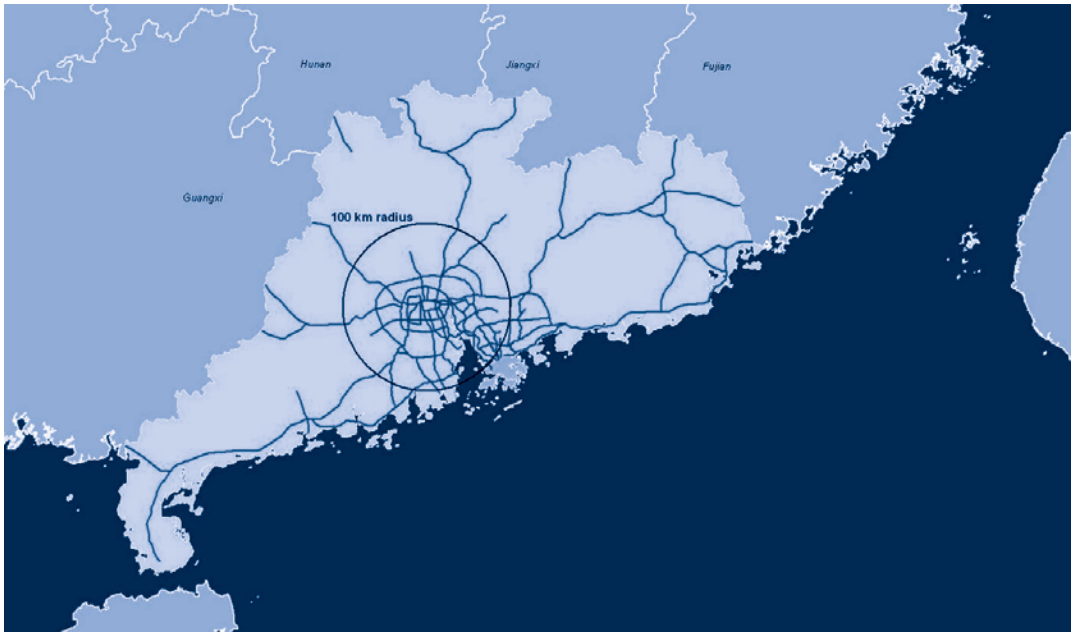
i) The development of the expressway network in the YRD is less concentrated spatially than in Guangdong. Guangdong's expressways in 2009 were heavily concentrated in Guangzhou and the Inner PRD (Figure 2.32). In comparison, expressways built in the YRD from 1990 to 2009 have extended beyond the core metropolitan region of Shanghai to link many more cities in a network over a larger area without border control constraints (Figure 2.33).

Figure 2.31. **Changes in three-hour drive-time accessibility, 1990-2020/2030**



Source: Author's GIS-based calculation using data from the Guangdong Provincial Government.

Figure 2.32. **Expressways in Guangdong province, 2009**



Source: Calculations based on data from the *OECD GIS database*, internal database and Ministry of Communications and Guangdong Provincial Development and Reform Commission data.

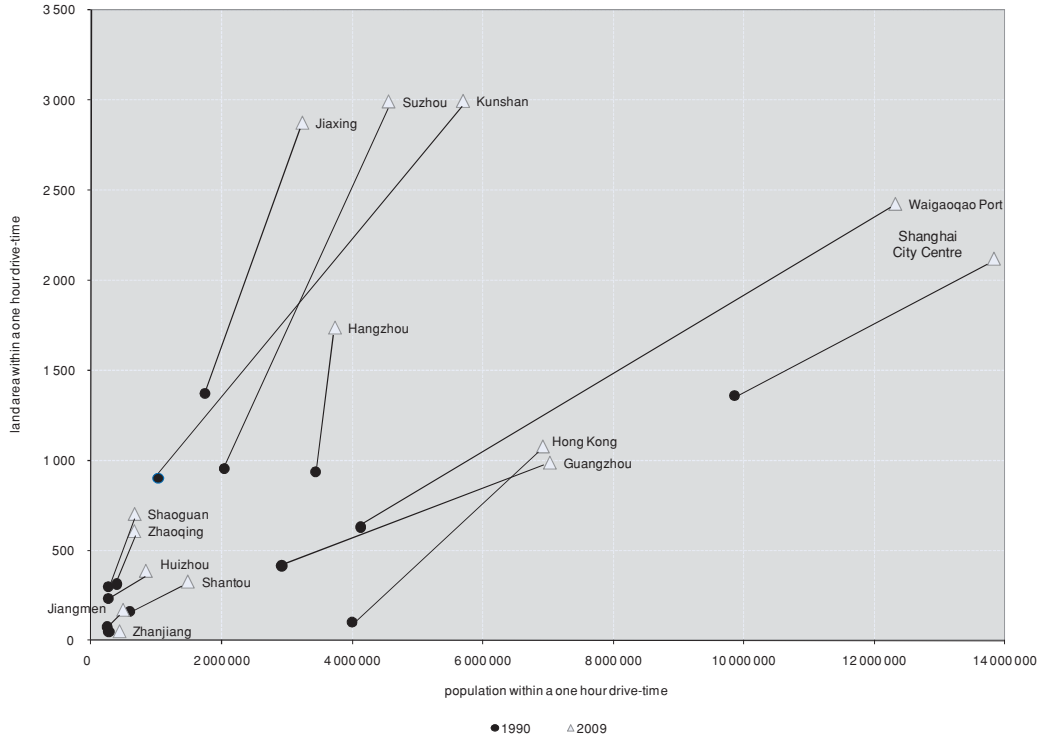
Figure 2.33. **Expressways in the Yangtze River Delta, 2008***

Note: This map is the same scale as Figure2.32.

Source: Calculations based on data from the *OECD GIS database*, internal database and Ministry of Communications and Guangdong Provincial Development and Reform Commission data.

ii) The expansion of one-hour catchment areas has been much more extensive for strategic locations in the YRD (Figure 2.34). While daily consumer and potential labour market sheds were already larger in strategic parts of the YRD in 1990, their increase in both territory and accessible population was enormous up to 2009. Shanghai (including its Waigaoqiao Port) now has consumer and potential labour sheds twice the population size of Guangzhou's and Hong Kong, China's. Significantly, Kunshan and Suzhou (in southern Jiangsu province) have had huge increases in both area and accessible populations within their one-hour drive-times.

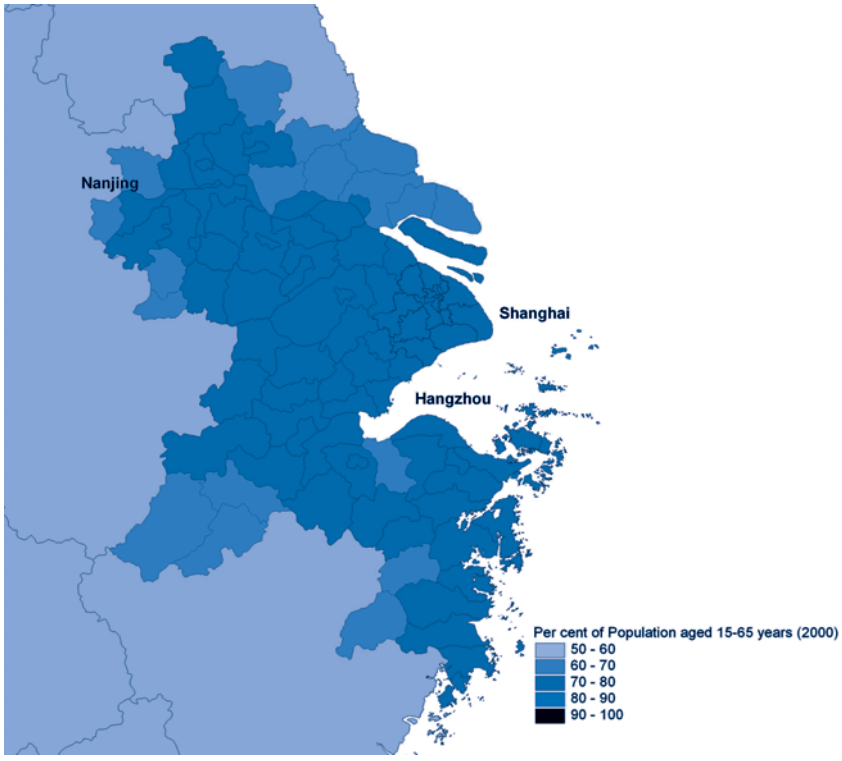
Figure 2.34. **One-hour drive times of selected cities in Guangdong and the Yangtze River Delta, 1990-2009**



Source: GIS-based calculation using data from the Guangdong Provincial Government, Zhejiang Provincial Government, Jiangsu Provincial Government, and Shanghai Municipal Government.

iii) Also significant is the uniformity across the YRD of working-age residents (in 2000) as a proportion of total population. The YRD's labour pool is far larger and uniformly distributed than in Guangdong (Figures 2.35 and 2.29). The wider labour sheds in the Inner YRD enable firms to hire from a larger labour pool than in Guangdong. Combined with the higher levels of educational attainment in the YRD, firms – especially in Shanghai, Suzhou and Kunshan – have been able to rapidly climb the value chain into medium and high value-added manufacturing and advanced producer services. The YRD has also demographic advantages over Guangdong of a larger, more uniformly distributed population of working age with higher educational attainment levels. The careful planning of high-speed roads by the Jiangsu, Shanghai and Zhejiang provincial governments has enabled both domestic and foreign firms to quickly tap into the human capital of the YRD by vastly improving accessibility. These advantages cannot be quickly or easily replicated in Guangdong.

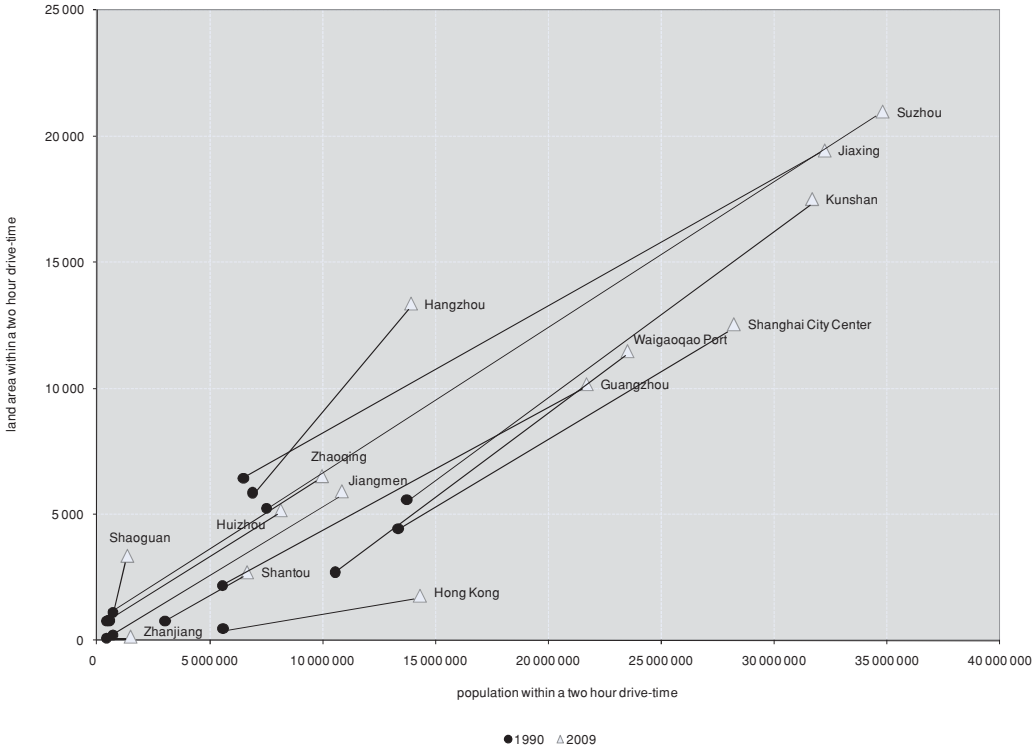
Figure 2.35. **Potential labour markets in the Yangtze River Delta, 2000**



Source: Calculations based on data from the *OECD GIS database*, internal database and the 2000 National Census of China, *www.stats.gov.cn/tjsj/pcsj/rkpc/dwcrkpc*.

iv) In terms of industrial location, the area accessible within two hours from a major container port is now three times larger from Waigaoqiao (Shanghai) than from Hong Kong, China (Figure 2.36). Suzhou, Kunshan, and Jiaxing (in Zhejiang province, near the border with Shanghai) are all within a two-hour drive time from Waigaoqiao and Shanghai's new container port at Yangshan. Significantly, the expansion in two-hour drive times from Jiaxing, Kunshan and Suzhou means that their firms have a far larger range of accessible, lower cost locational options than firms in Guangdong. Their ability to access multiple suppliers from a far larger area also serves to drive competition in quality and cost. Equally important, the expressway network has opened up a very wide range of accessible locational options for industrial firms at far lower land costs than in concentrated metropolitan cores.

Figure 2.36. **Two-hour drive times of selected cities in Guangdong and the Yangtze River Delta, 1990-2009**



Source: Author's GIS-based calculation using data from the Guangdong Provincial Government, Zhejiang Provincial Government, Jiangsu Provincial Government, and Shanghai Municipal Government.

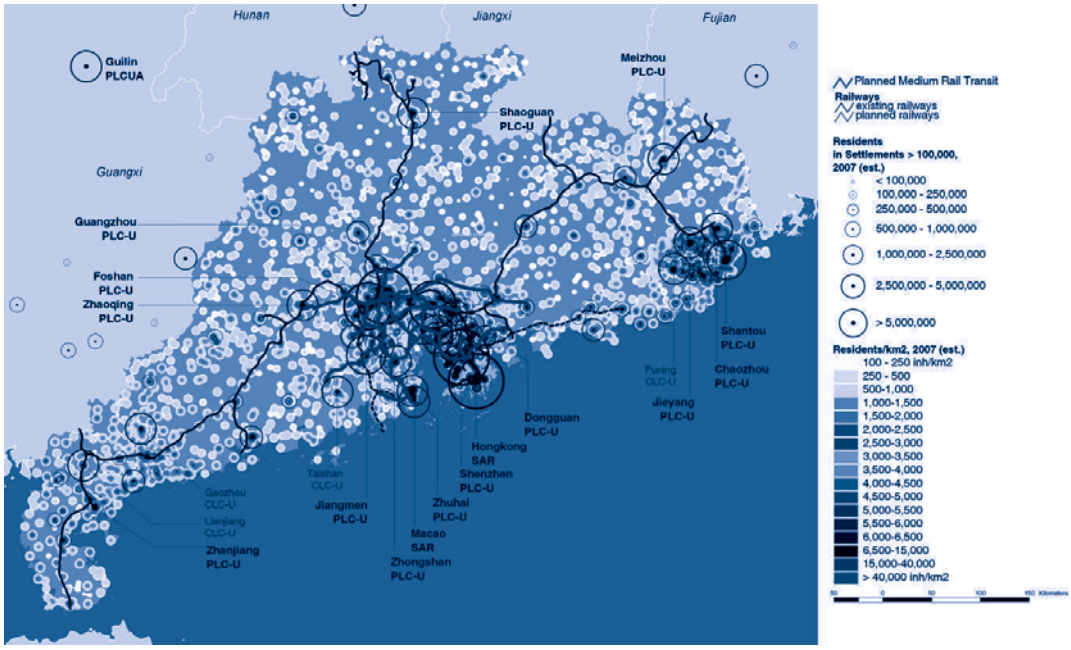
Railway

Guangdong's existing freight railway network is very limited and targeted, for historical reasons, on Guangzhou (Figure 2.37). There is no continuous coastal network although a line is planned from Shenzhen to Lufeng. Given that the bulk of goods from export processing are containerised, road transport has been the principal mode for moving the majority of Guangdong's outputs. There are only two double-tracked container lines in Guangdong: from Guangzhou north to Wuhan; and from Shenzhen northeast to Huizhou. Guangdong's rail task is concentrated on shipping bulk commodities, such as coal, ores, and minerals. Unlike in Europe and North America, there is virtually no capacity in the railway system to handle containers: this major element of a modern intermodal transportation system is missing in Guangdong (as in the rest of China). It was only recently, in 2007, that construction began again on the Guangzhou-Zhuhai freight railway after 10-year delay. It is scheduled to be completed in 2011.[25]

Extensive high-speed regional commuter railways to connect Guangdong are either planned or already in place to improve labour mobility, particularly between major cities of the Inner PRD. However, the impact on labour mobility between the Inner PRD and the rest of the province as well as Hong Kong, China will be limited. A commuter rail line (MTR) between Hong Kong, China's core (Hung Hom Station) and Luohu[26] on the

border with Shenzhen has been operating since 1983. Among the National High Speed Rail lines connecting Guangdong, Wuguang commuter rail started in late 2009 to connect Guangzhou and Wuhan, the capital city of Hubei province in central China, reaching a maximum in-service speed of 350 km/h.[27] Two rail transit systems are being planned by the Guangdong provincial government and Hong Kong, China that will significantly reduce travel times between Hong Kong, China and Shenzhen, Dongguan, and Guangzhou: *i*) a rapid transit system across the Inner PRD, expected to be completed by 2030 (Box 2.4 and Figure 2.37);[28] however, apart from the Inner PRD, there is virtually no rapid transit to connect with the Outer PRD, the Eastern and Western Corridors; and *ii*) a Guangzhou-Shenzhen-Hong Kong, China High Speed Rail Link that will reduce travel time to 48 minutes between Hong Kong, China and the southern suburbs of Guangzhou. However, it is unlikely that either project will comprise a "commuter rail" network for Hong Kong, China: aside from affordability constraints, without the removal of border crossings and the integration of social security and educational and professional systems, the vast majority of Hong Kong, China's daily labour market is likely to remain within its boundary until at least 2020. Apart from accessibility concerns, the rapid development of public railway transport and future growth of passenger ridership could help improve total energy efficiency of Guangdong.

Figure 2.37. **Existing and planned heavy and medium rail**



Note: Bold lines are the planned "PRD Regional Commuter Rail Network". Thin lines are the long-distance rail lines.

Source: Author's calculation from network mapping by the Ministry of Railways, and population data from the 2000 National Census of China.

Box 2.4. **PRD Regional Commuter Rail Network plan to 2030**

The latest revised Plan for the Inter-city Rail Transport Network in the Pearl River Delta has been endorsed in principle by the Guangdong provincial government and submitted to the National Development and Reform Commission for review and approval. According to the plan, by 2030 all the towns and cities in the Pearl River Delta are to be covered in a rail transport system with a network density of 4.8 kilometres of rails per 100 square kilometres.

Compared with the previous plan approved by the State Council in 2005, the latest version features 18 additional lines (on top of the existing 5 lines) with the length of rails to be increased from 600 kilometres to 1 890 kilometres.

Over CNY 370 billion will be invested in the entire project. Meanwhile, junctions will be reserved for rail connection with Western, Eastern and Northeastern Guangdong. With the Pearl River Delta Light Rail Network completed, Guangzhou will serve as the hub for inter-city transport, with trains running in each direction. Passengers in Guangzhou can get to any major city in the area by rail within one hour. Cities and towns in the inner circle can be reached within one hour and one-hour access can be also achieved between Guangzhou, Shenzhen and Zhuhai.

Source: Guangzhou Municipal Government website, *www.newsgd.com/pictures/construction/content/2009-08/20/content_5596693.htm.*

Trade obstacles

Since the introduction of the "Open Door" policy, China has experienced a rapid integration into the global economy which greatly benefited Guangdong. The opening up of the Chinese market to foreign companies has become more apparent with the junction of the World Trade Organisation (WTO) in December 2001. This process has been reinforced by the establishment in 2005 of the "Guidelines of Encouraging and Supporting the Development of the Non-Public Sector Including Individual and Private Enterprises" by the State Council (OECD, 2010c). As a result, protectionism was reduced allowing formal legal barriers to entry more comparable to those in OECD emerging markets,[29] according to the Product Market Regulation (PMR) indicators (OECD, 2010c). Thanks to its strategic location which allows a privileged access to new markets like Vietnam, Indonesia, Malaysia and Philippines, and a competitive port system in the PRD, Guangdong has greatly benefited from China's WTO accession, attracting more diversified foreign investment, developing new export markets and producing more medium and high value-added manufacturing goods and services.

As China, and Guangdong, are now trying to better exploit the domestic market and develop new international ones in higher value-added niches, as a way to ensure a sustainable economic path of growth, there are a number of trade obstacles and regulatory issues on competition in products that remain.

i) On the national scale, recent OECD work highlights the increased competition in product markets and the impact of market forces on price formation and economic behaviour (OECD, 2010c). The potential benefits of such initiatives are obvious: decreased dependence on exports and the chance to make domestic consumption a sustainable engine for further growth. However, the high entry cost of the Chinese domestic market caused by severe market segregation continues to make exports more attractive in Guangdong. Examples of market segregation range from local government setting quantity control for non-local goods, or giving preferential treatment to local firms on trademarks or intellectual property rights (Zhu *et al.*, 2005). Moreover, international

trade and foreign direct investment have encouraged domestic firms to incorporate foreign technologies into the production process, nevertheless some limitations on foreign participation still exist. These limitations especially appear in sectors like maritime and air transport, law and accounting, tourism, and postal sectors (OECD, 2010c).

ii) Market access is also limited by certain characteristics of the Chinese domestic market. "Local protectionism" remains a significant obstacle to the development and integration of the domestic market (Li *et al.*, 2004). Internal barriers include:

- restrictions on labour market mobility, e.g. local government requiring enterprises to first hire workers with local *hukou;*
- non-concrete barriers and restrictions, e.g. difficulties exist for non-local workers to obtain *hukou*;
- restrictions on the mobility of high-tech inputs (e.g. human capital, institutional and production capacity), i.e. through administrative interventions, local governments tend to discourage local technological staff or professional labour to work for non-local firms, and are reluctant to share important high-tech facilities with non-local firms;
- as regulations vary across provinces, companies have to deal with a wide variety of offices and institutions. In some inner areas there are no offices providing general assistance to firms;
- direct quantity control on selling non-local products;
- direct price control or subsidies, e.g. public procurement favours locally produced goods;
- obstacles to financing non-local enterprises;
- obstacles on raw input materials;
- establishing a distribution network in China requires a huge investment in terms of resources and knowledge;
- there is still a lack of understanding of the mainland market in terms of trends, customer preferences, etc.

According to Li *et al.* (2004), despite recent progress, these obstacles are likely to remain for years to come. The author also points out that "local protectionism" is more severe in non-coastal provinces, putting eastern coastal provinces like Guangdong at a disadvantage when trying to break into these markets. This could be due to lower private sector development in non-coastal regions. For example, in 2007, the private sector accounted for 80% of value added for the 5 leading eastern coastal provinces compared to 50% in other regions, although that is twice the level it was in 1998 for the latter regions (OECD, 2010c).

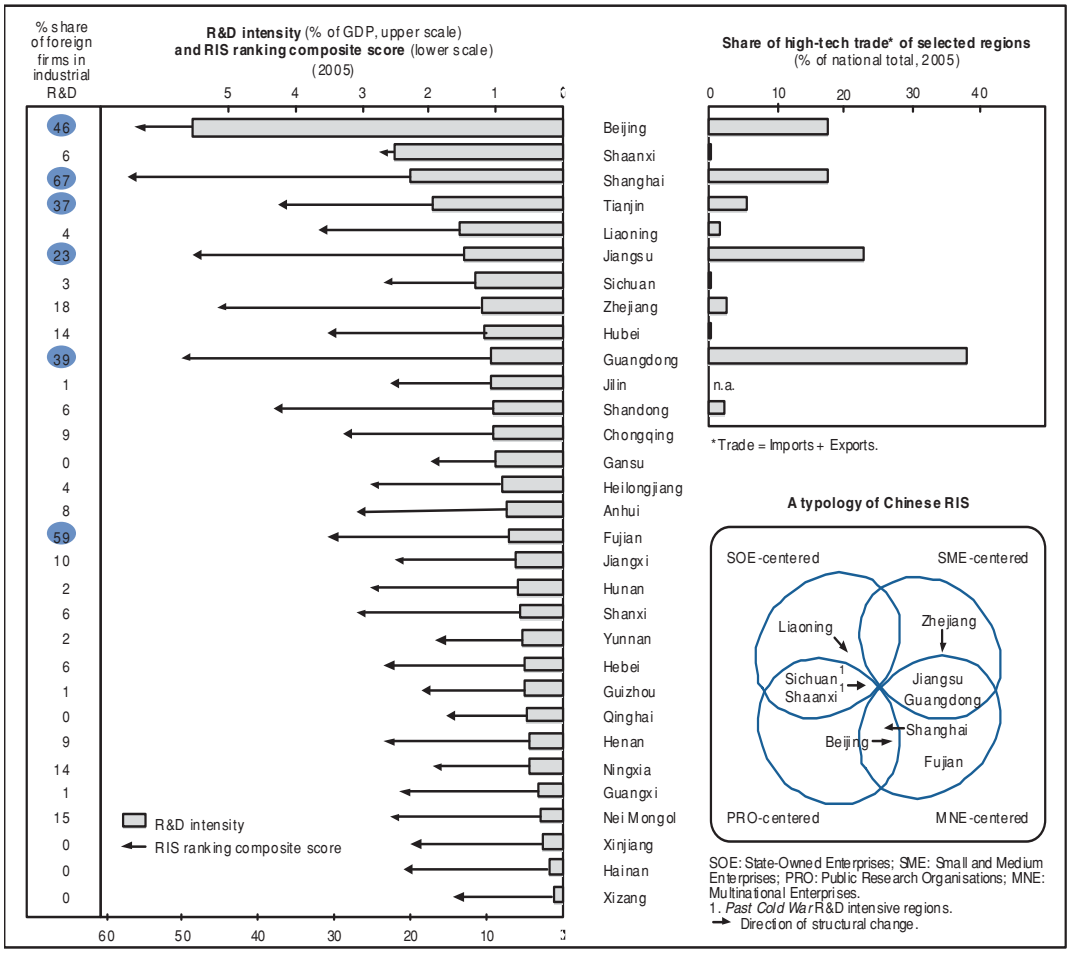
Given the volatility of the export market and the challenges of the domestic market, Guangdong will likely continue efforts to strengthen and develop activities in both areas; in the long term they could even become mutually enforcing. For example, OEM firms might seek to harness the large domestic market potential by establishing their own brands for domestic sale. These branded products could eventually offer higher profit margins in the export market (Zhu *et al.*, 2005). OECD analysis suggests the unleashing

this potential requires, in part, that China continue national reforms that open sectors of the economy that are sheltered from the global economy (OECD, 2010c, p. 124).

Innovation capacities

Guangdong has been a strong export processing-led economy, but it is as yet uncertain whether or not its innovation system has the necessary elements to sustain the region's future growth. As the province seeks to restructure its economy to higher value-added manufacturing, innovation capacities will play a key role in determining the extent of restructuring and the position of Guangdong firms in the global value chain. The region can build on its already strong position within China for high-tech trade (imports and exports), accounting for almost 40% of China's total in 2005 (Figure 2.38).

Figure 2.38. **Chinese regional innovation systems (RIS)**



Source: OECD (2008), *OECD Reviews of Innovation Policy: China*, OECD Publishing, Paris; Chinese *Ministry of Science & Technology online database*; Science & Technology Development Strategic Research Team (2006), *Annual Report of Regional Innovation Capacity of China 2005-2006*, Science Publishing, Beijing; OECD based on Xielin Liu.

One national ranking of regional innovation system capacity places Guangdong second in China. The index, developed by the S&T Development Strategic Research

Team, evaluates all provinces and municipalities with provincial status in China. The region had consistently ranked third for the last several years, following Beijing and Shanghai (Table 2.5). The province has only recently surpassed Shanghai and ranked second. Of the different areas, knowledge creation capacity is one where the region had not scored as high, in relative terms, as in the past. This is due in large part to the lesser degree of research infrastructure relative to other leading Chinese regions.

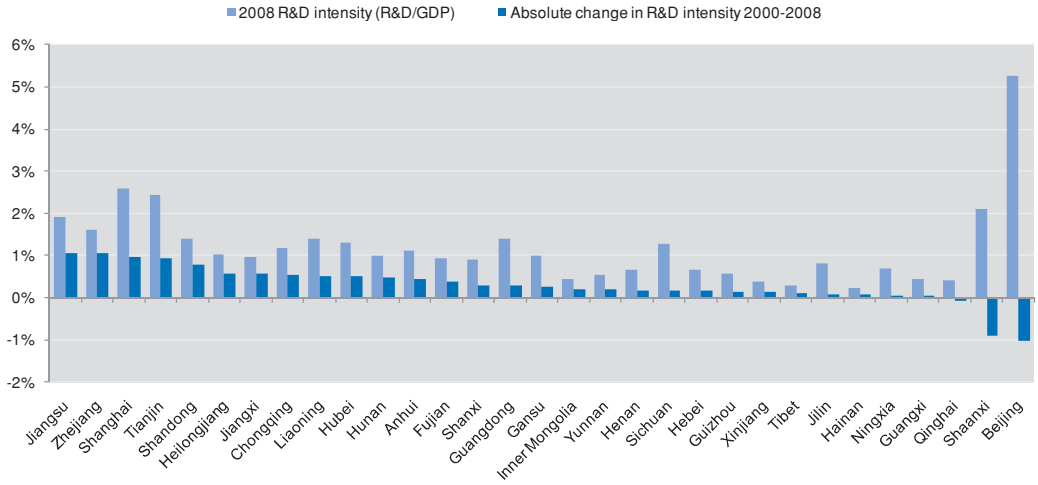
Table 2.5. **Regional innovation capacity in Guangdong**

	2001	2002	2003	2004	2005	2006-07	2008	
	Ranking	Ranking	Ranking	Ranking	Ranking	Ranking	Value	Ranking
Overall score	3	3	3	3	3	3	52.65	2
Knowledge creation capability	6	4	3	7	5	3	43.93	3
Knowledge acquisition capability	2	1	2	3	4	3	41.72	3
Enterprise technology innovation capability	1	4	2	4	3	3	60.61	1
Innovation environment and management	17	5	3	3	3	3	41.95	4
Economic performance of innovation	4	4	4	2	2	3	70.80	1

Source: www.sts.gd.cn/show.asp?ArticleID=577 based on China S&T Development Strategic Research Team (2008), *Annual Report of Regional Innovation Capability of China 2008*, Science Publishing, Beijing.

One important input to an innovation system is R&D investment, which Guangdong has considerably increased. From 2000 to 2008, expenditure on R&D in the province grew from CNY 10 711 million to CNY 50 260 million in current prices, almost a fivefold increase (*NBS China database*). Its scale makes it one of the top regions in terms of cumulative R&D investments in recent years. While these higher investments have resulted in increased R&D intensity, that figure is growing even faster in other Chinese regions. In terms of cumulative R&D spending on a per capita basis (1998-2007), Guangdong ranks only sixth, behind Beijing, Shanghai, Tianjin, Jiangsu and Liaoning. For example Guangdong's per capita spending was 12% smaller than Jiangsu province in the Yangtze River Delta.[30] Guangdong's R&D intensity (R&D as a share of GDP) increased from 1.11% in 2000 to 1.41% in 2008. However, its ranking in China declined from the 6th province in 2000 to the 8th in 2008, lower than Beijing, Shanghai, Tianjin, Shaanxi, Jiangsu, Zhejiang and Liaoning provinces. In terms of growth, the net increase in R&D intensity was higher in 14 other provinces, as Guangdong ranked only 15th (Figure 2.39). For example, Jiangsu and Zhejiang increased their R&D intensity over the period by 1.1 percentage points, Shanghai by 1 percentage point, and Tianjin by 0.9 percentage points. In contrast, Guangdong increased by only 0.3 percentage points. Compared internationally, Guangdong's R&D intensity falls short of leading international innovative regions' but does perform better than many OECD regions.[31] The overall OECD average for R&D intensity is 2.26% (2006). Because regions are a smaller unit of analysis, the range of regional R&D intensity is much higher (from 0.09% to 7.43%). The average of the R&D intensities of OECD regions with data is 1.59% (versus 1.41% in Guangdong).

Figure 2.39. **R&D intensity in 2008 and change since 2000**

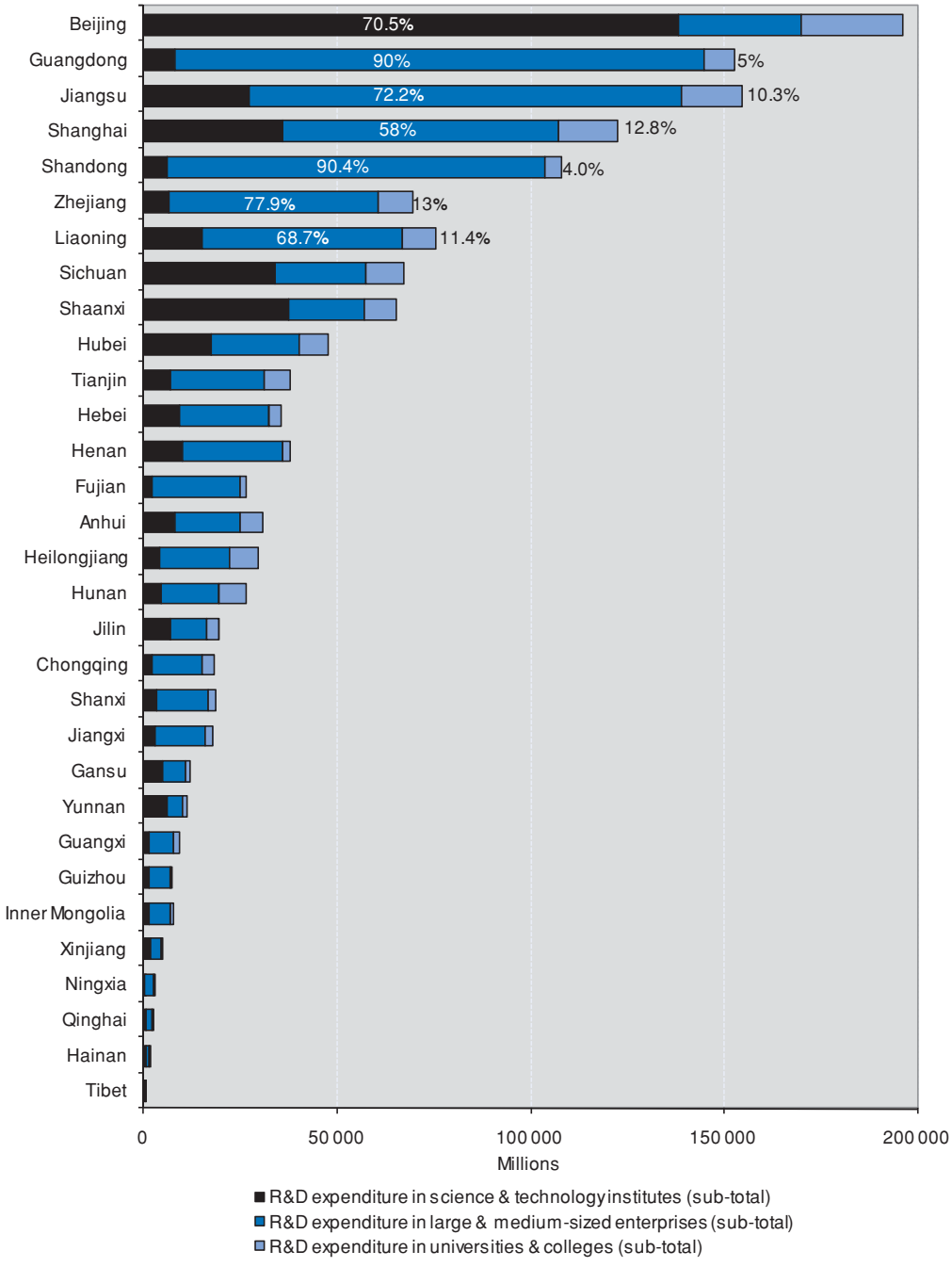


Source: National Bureau of Statistics of China database, *www.stats.gov.cn/english/statisticaldata/yearlydata*; *CEIC database*, *www.ceicdata.com*.

Guangdong's innovation system is clearly private-sector led. An RIS typology by type of system illustrates that Guangdong's RIS is driven by small and medium-sized enterprises (SMEs) as well as multinational enterprises (MNEs), similar to that of Jiangsu. Around 90% of cumulative R&D investment from 1998 to 2007 was made by relatively few large and medium-sized enterprises (Figure 2.40).[32] MNEs in Guangdong account for 39% of business R&D expenditure, although this share is below several other provinces like Shanghai, Fujian or Beijing (Figure 2.40).

Figure 2.40. **Cumulative expenditure on non-defence research and development, 1998-2007 by province**

In millions CNY

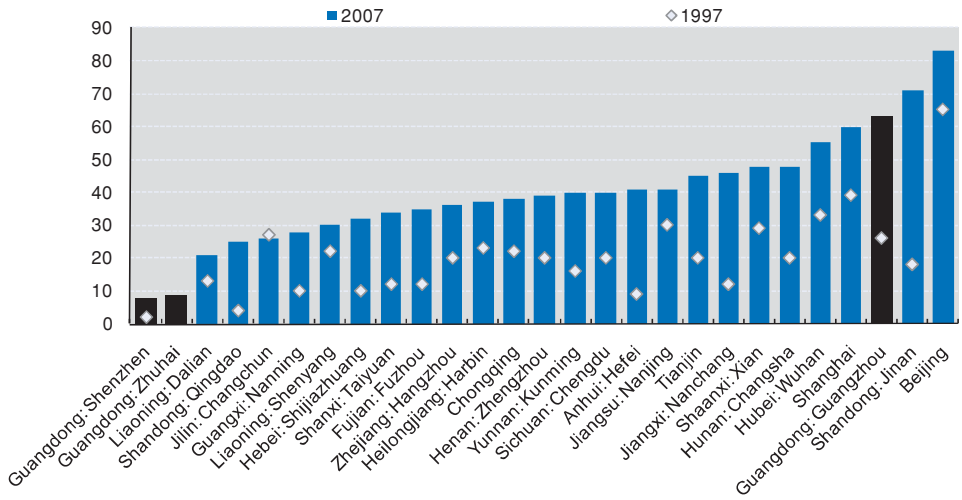


Source: National Bureau of Statistics of China database, www.stats.gov.cn/english/statisticaldata/yearlydata; CEIC database, www.ceicdata.com.

Guangdong's innovation system has therefore developed despite a limited infrastructure of public research organisations and higher education institutions (HEIs). Relatively little R&D spending was made by science and technology institutes or universities, especially in comparison with Beijing and Shanghai. Historically, Guangdong has not been a main destination for national public R&D investment. Weak public R&D capacity could result from insufficient financing, a low density of scientific and technical personnel, and/or a weak culture of innovation in regional institutions.

One contributing factor is the comparatively small number of advanced universities in Guangdong. Although the provincial capital Guangzhou experienced a large increase in the number of universities, from 26 in 1997 up to 63 in 2007 (Figure 2.41), few of these HEIs received top ranking internationally (Table 2.6). The situation is even less favourable in Shenzhen city, which is economically prosperous with per capita income comparable to Shanghai, Beijing and Guangzhou (Chapter 1). The city had only 8 colleges and universities in 2007 (Figure 2.41). Of course it is not the number *per se* of HEIs, rather the capacity in terms of number and quality of students and researchers.

Figure 2.41. **Number of colleges and universities in selected Chinese cities, 1997 and 2007**



Source: National Bureau of Statistics of China database, *www.stats.gov.cn/english/statisticaldata/yearlydata*; *CEIC database*, *www.ceicdata.com*.

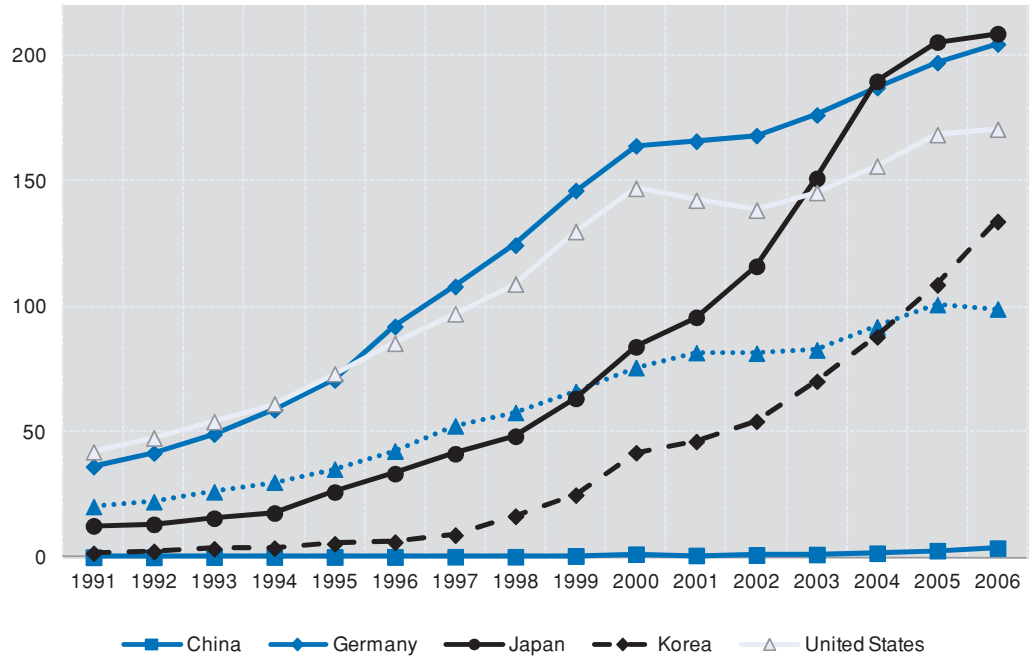
Table 2.6. **Chinese universities among top 100 in Asia, 2007**

	1	2	3	4	5	6
Asia rank	1-10	10-18	19-24	25-42	43-64	65-100
World rank	1-101	102-150	151-202	203-304	305-402	403-510
Beijing			Tsinghua University	Peking University		China Agricultural University
Tianjin						Nankai University Tianjin University
Chinese Taipei			National Taiwan University		National Cheng Kung University National Chiao Tung University National Tsing Hua University	National Central University National Yang Ming University
Shanghai				Shanghai Jiao Tong University	Fudan University	
Nanjing				Nanjing University		
Hangzhou				Zhejiang University		
Hong Kong				Chinese University of Hong Kong City University of Hong Kong Hong Kong University of Science & Technology		Hong Kong Polytechnic University
Guangzhou						Zhongshan University
Hefei				University of Science & Technology of China		
Changchun					Jilin University	
Lanzhou						Lanzhou University
Jinan						Shandong University

Source: Jiaotong University (2007), "World Ranking Survey", *www.arwu.org*.

The number of patent applications is another indication of a region's innovation capacity. Guangdong is in a country with an extremely low but slowly increasing patenting rate. The figure for China went from nearly 0 to 2.9 Patent Co-operation Treaty (PCT) patent applications per million inhabitants between 1991 and 2007. In comparison, over the same period there was a higher rate of increase in patent applications in OECD member countries like Japan and Korea (Figure 2.42).

Figure 2.42. **Patent Co-operation Treaty patent applications per million inhabitants, 1991-2007**



Source: OECD Patent database, http://stats.oecd.org/Index.aspx?DatasetCode=PATS_IPC.

Within the region, this inventive activity (patenting), is highly concentrated in one single firm, requiring more active efforts to ensure spillovers. Knowledge centres act as a platform to promote spillovers and exchanges with other firms. In Guangdong, over 80% of the provincial patents are held by firms in Shenzhen; of these, 70% are held by Huawei, a telecommunications equipment manufacturer which also surpassed Phillips and ranked as the largest applicant under WIPO's Patent Co-operation Treaty (PCT) in 2008 (WIPO, 2008). Through more deepened co-operation between public research organisations, universities, large firms, and small firms, Guangdong's regional innovation system could be more productive. Some initiatives have already begun; for example, Huawei signed a co-operation agreement with Zhongshan University on digital TV in 2008.

Building SME absorption capacity will enable a much wider pool of firms to innovate. SMEs generally operate in highly competitive sectors with low profit margins. They are reluctant to invest limited profits in R&D, partially because of the dominant business model among SMEs. Most of these firms are in original equipment manufacturing (OEM) in which they fabricate components according to designs and specifications provided by firms higher up on the industrial value chain. The innovation is conducted by the offshore firms who shop among Guangdong's OEM enterprises to lower their costs of production (Ding, 2007). By gaining innovation capacity, these SMEs can also diversify their customer base and be better able to survive in the long term.

Firms with foreign ownership do not sufficiently invest in R&D, resulting in sub-optimal spillovers of FDI in the region. They also produce more than half of the added industrial value in the Inner Pearl River Delta. However, a recent survey of R&D

by multinational corporations in China found that R&D intensity at firm level (R&D as a percentage of sales) among MNCs is actually lower than among domestic firms. Furthermore, R&D in Guangdong is "market driven" (e.g. localising products for the domestic market), in Beijing it is "technology driven" (e.g. driven by the strong technological capacities of government-controlled research institutes), and in Shanghai it is a mix in addition to being "human resources" driven (Motohashi, 2005). It appears that foreign-invested firms conduct their basic and applied R&D in their home or other countries, and focus minimal R&D in Guangdong as they are simply localising some aspects of production for the domestic market. This is true for many regions in the OECD, including in Mexico, for example, where its majority foreign-owned firms spent a lower share on S&T than domestic firms due to a focus on assembly (OECD, 2009e).

Notes

1. Peugeot had set up a joint venture (JV) with the local government in the 1980s when demand was nascent, the regulatory environment was undeveloped, and when corporate culture was far more statist than today. The JV partners gradually diverged, and Peugeot decided to leave the Chinese market. It returned to China in the early 2000s.

2. In 2009, CNOOC commissioned a refinery in Huizhou which is now capable of processing 12 million tons of crude oil annually. Its prime function is to supply a huge ethylene plant, also located in Huizhou and jointly invested by CNOOC and Royal Dutch/Shell. CNOOC is planning to extend investments in Huizhou into additional petrochemical operations to expand its capacity to 20 million tons per year. Nearby on the Dapeng Peninsula in Shenzhen, PetroChina has recently announced plans to build a USD 1 billion LNG Terminal to be supplied from Australia.

3. Maoming is Sinopec's second largest refinery in China, with a processing capacity of 13.5 million tons a year. The Dongxing refinery reached the annual processing capacity of 8 million tons of crude oil in 2009, and is currently planned to be expanded to process 15 million tons a year in the next few years.

4. The area of the Yangtze River Delta region incorporates 20 relatively developed PLCs in 3 provinces, namely Shanghai, Nanjing, Hangzhou, Ningbo, Suzhou, Wuxi, Changzhou, Zhenjiang, Yangzhou, Taizhou, Nantong, Huzhou, Jiaxing, Shaoxing, Zhoushan. More often, the comparison is made between the broad concept of YRD comprised of Shanghai, and Jiangsu and Zhejiang provinces, and the broad concept of PRD (Guangdong plus Hong Kong, China and Macao, China).

5. For example, if a foreign firm invests in short-term real estate development, or in a low value-added manufacturing facility, profits are generally realised within two years. If they are re-invested, this appears as a positive contribution. Conversely, if they are taken out of the country (or province) by the investor, this obviously reduces the net value of foreign investment.

6. Data have recently become available that report the net balance of investments of foreign-invested firms at the provincial scale. Unlike FDI amounts, these "net" figures account for profit repatriation.

7. The share of value added generated by goods export-to-GDP is the product of the goods export-to-GDP ratio and the domestic value added in goods exports.

8. Since Guangdong's share of processing trade is in general higher than the national level, the final estimated figure might slightly overestimate exports' contribution to GDP.

9. The problem with Li and Xu's data on Guangdong is that the GDP per capita data for 1997-2004 have been calculated from the registered population, while since 2005 data have been based on the permanent population. A revised version using MMR based

on permanent population indicates that Guangdong's disparity was the 4th highest in 2004, and the 5th highest in 2005.

10. The Theil Index is a statistical method to measure economic inequality, for details see Theil, H. (1967), *Economics and Information Theory*, North-Holland Publishing Company, Amsterdam.

11. Similarly, for statistical reasons, non-domestic includes ownership from Hong Kong, China, Macao, China, Chinese Taipei and foreign countries.

12. Migration has an important impact on age pyramids for rural and urban populations in China. The growing outflow of young workers makes the rural age pyramid much thinner for those between 20 and 34 years old. In turn, their inflow to urban areas compensates to a large extent the impact of a stricter one-child policy on the demographic structure of urban population. In Guangdong, 80% of rural migrants are between the ages of 16 and 30. Problems also arise from a relatively rising dependency ratio in rural areas in relation to urban areas, since it is found that 70% of the elderly live in the countryside.

13. Called "senior middle" in the Chinese system, this represents 9-12 years of education.

14. The most recent consistent and reliable data on educational attainment at the local level are for the year 2000 from the National Census of China, the next one will be in 2010.

15. The year 2000 National Census enumerated migrants in addition to locally-registered residents.

16. Road classes, set by the Ministry of Communications, are: NH Class I: design speed 60-100 km/hr, capacity 15 000-30 000 vehicles per day; NH Class II: design speed 40-80 km/hr, capacity 3 000-7 500 vehicles per day; NH Class III: design speed 30-60 km/hr, capacity 1 000-4 000 vehicles per day; NH Class IV: design speed 20-40 km/hr, capacity 200-1 500 vehicles per day.

17. The National Trunk Highway System was designed in the early 1990s by China's Ministry of Communications to be a 35 000 kilometre network of 12 major highways: 5 north-south corridors (Beijing-Fuzhou, Beijing-Zhuhai, Chongqing-Zhanjiang, Erlianhaote-Hekou, and Tongjiang-Sanya); and 7 east-west corridors (Dandong-Lhasa, Hengyang-Kunming, Lianyungang-Huoerguosi, Qingdao-Yinchuan, Shanghai-Chengdu, Shanghai-Ruili, and Suifenhe-Manzhouli). When completed in 2007, the National Trunk Highway System connected all provincial capitals and cities with populations over 500 000 inhabitants (100 major cities). In December 2004, the Chinese government approved an expanded National Trunk Highway System, called the "7918 Highway Network." The plan comprises building 7 capital radials, 9 north-south major highways and 18 east-west corridors, totalling 85 000 kilometres of high-grade expressways. The Ministry of Communications expects this network to be completed by 2020. It is designed to serve more than 1 billion people by connecting all provincial capitals and large urban centres of more than 500 000 inhabitants with cities of more than 200 000 inhabitants.

18. Projections for 2020 and 2030 length figures are derived from the highways and expressways map in the official plan, using GIS-based calculations. The nuances of this approach mean that those projections may be slightly shorter than the lengths of road actually constructed.

19. Road densities are a rough indicator of accessibility potential, measuring the length of road per square kilometre of area served, and provide insights to the extent of access to and from regional markets.

20. Expressway densities are expressed here as km/km² of habitable area, e.g. discounting areas with slope greater than 8°, as reviewed earlier in Chapter 1of this report.

21. Direct air flights between Chinese Taipei and mainland China started recently in 2008. Prior to that, business owners in Chinese Taipei needed to travel from Hong Kong, China or Macao, China for mainland flights. This meant that Chinese Taipei firms used Hong Kong, China as their base for making investments in Guangdong.

22. These are reported every ten years in China's National Census.

23. The concentration of working age population in the PRD partly reflects migration into the PRD from the rest of Guangdong.

24. The accessibility analysis of the YRD was conducted by Chreod in 2007 for the World Bank using the same approach and methods used in this accessibility analysis of Guangdong (Chreod, 2007).

25. For more details, please refer to China Rail website: *www.railcn.net/news/railway-express/95588.html.*

26. Luohu is the principal border crossing for travellers to and from the mainland.

27. For more details, please see China Daily (2009-12-26), "Wuhan-Guangzhou Bullet Train Link to Hit Airlines Hard", *www.chinadaily.com.cn/china/2009-12/26/content_9232823.htm.*

28. The first section connecting Guangzhou and Zhuhai (Guangzhou-Zhuhai Inter-City Mass Rapid Transit) will be completed in late 2010 for the opening of Guangzhou 2010 Asian Games.

29. OECD emerging markets comprise the Czech Republic, Hungary, Korea, Mexico, Poland and Turkey.

30. Data are from China's Ministry of Science and Technology.

31. If the R&D data follows the OECD *Frascati Manual* guidelines.

32. For statistical purposes in China, only R&D investment by large and medium-sized firms, but not small firms, is included.

Chapter 3

Strategies and policies for regional competitiveness in Guangdong

This chapter will first review the policy instruments that have been implemented since the introduction of the "Open Door" policy in the province of Guangdong, which have led to the formation of an externally oriented economic development, e.g. promotion of investment attraction and spatial industrial specialisation. Conscious of the emerging challenges, the central and the provincial governments have recognised the limits of the Guangdong economic model and reiterated their wish to promote the region as a key development pillar of China through industrial upgrading whilst preserving the spirit of China's harmonious society by dealing with territorial equity issues. This shift in view is expressed in the main strategic policy documents: the Five-Year National and Provincial Plans, as well as the "Outline for the Pearl River Delta", the central government's first sub-provincial regional development strategy produced in the history of the People's Republic of China. These documents are detailed in the second section of this chapter. The implementation of this strategy based on two main pillars, upgrading the industrial base and the "Double Relocation" policy, is reviewed in the third section. Although it represents an ambitious plan to move forward, promoting principles of both "excellence" and "harmony", some of the instruments used for implementing this strategy have demonstrated their limits in OECD member countries. The last section discusses how the current policy framework in Guangdong could be adapted to foster a regional development approach, shifting from a top-down approach with a heavy focus on redistributive subsidies, towards a new paradigm oriented toward integrated and well-targeted investment based on existing competitive advantages and untapped potential (which differ across sub-regions) and by focusing more on soft assets.

Introduction

Globalisation has increased the pressure on OECD member countries to move up the value chain and engage in a continuous process of innovation. Today, China's goals are no different from those of OECD member countries. Its role in the global economy is no longer defined by a simple export-driven model based on the low-cost provision of labour and resources and the development of technology-led sectors; developing high value capabilities has become a key policy focus. This is particularly true for Guangdong, whose success has been based on relocation, outsourcing, and off-shoring of low value-added industries principally from Hong Kong, China and Chinese Taipei. As developed in previous chapters, recent trends point to increasing challenges from rising labour costs, and the limited availability of land, while the global economic crisis has aggravated the economic situation. However, as was also demonstrated previously, economic difficulties started before the global crisis in Guangdong. These include structural weaknesses in the evolving global environment, including in innovation capacity and advanced human capital, as well as strong spatial imbalances of input location and accessibility.

This chapter will first review the policy instruments that have been implemented since the introduction of the "Open Door" policy in the province of Guangdong, which have led to the formation of an externally-oriented economic development, e.g. promotion of investment attraction and spatial industrial specialisation. Conscious of the emerging challenges, the central and the provincial governments have recognised the limits of the Guangdong economic model and reiterated their wish to promote the region as a key development pillar of China through industrial upgrading whilst preserving the spirit of China's harmonious society by dealing with territorial equity issues. This shift in view is expressed in the main strategic policy documents: the Five-Year national and provincial plans, as well as the "Outline for the Pearl River Delta", the central government's first sub-provincial regional development strategy produced in the history of the People's Republic of China. These documents are detailed in the second section of this chapter. The implementation of this strategy based on two main pillars, upgrading the industrial base and the "Double Relocation" policy, is reviewed in the third section. Although it represents an ambitious plan to move forward, promoting principles of both "excellence" and "harmony", some of the instruments used for implementing this strategy have demonstrated their limits in OECD member countries. The last section discusses how the current policy framework in Guangdong could be adapted to foster a regional development approach, shifting from a top-down approach with a heavy focus on redistributive subsidies, towards a new paradigm oriented toward integrated and well-targeted investment based on existing competitive advantages and untapped potential (which differ across sub-regions) and by focusing more on soft assets.

3.1. An economic development policy model based on investment attraction and industrial clustering

Policies to attract foreign investments

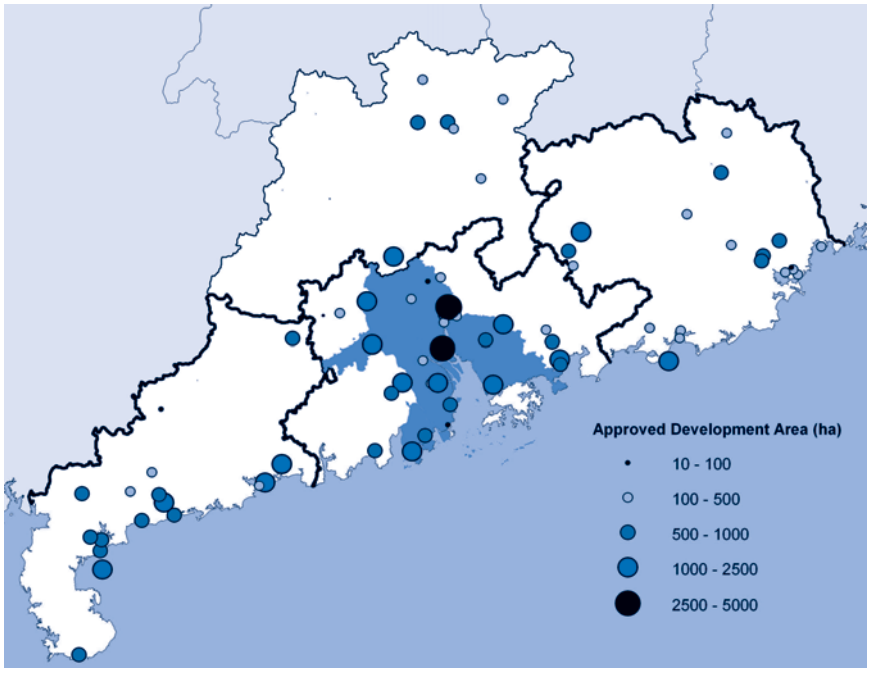
Since the introduction of the "Open Door" policy and the explicit choice of Guangdong as a pilot site, public policies have been mainly aimed at guiding industrial development to attract foreign direct investment (FDI), benefiting from the proximity of Hong Kong, China and Chinese Taipei. According to national government planners, this proximity would have favoured the diffusion all over the province of a high entrepreneurial spirit, contributing to enrich the area with knowledge and best practices coming from the Western world. While the first instrument implemented under this new approach was the special economic zones (SEZs) that was confined to 3 cities in Guangdong (see Chapter 1), the idea was later expanded to various development zones and parks. Similar to SEZs, these development zones offer a range of fiscal and policy incentives, providing the whole PRD the leverage to attract investment.

With the decentralisation of the decision-making process, and the introduction of the "Fiscal Contracting System" reform in 1980, local governments were provided with incentives to vigorously promote local economic development, mainly through attracting industrial investments. Under the new system, budgetary revenue income was first divided between "central fixed revenue", all of which was remitted to the central government, and "local revenue", which was shared. Subsequently, the provincial authority established similar fiscal arrangements with sub-provincial governments, although sharing rates varied from city to city. For instance, Shenzhen, Zhuhai and Shantou could retain all revenue, while Guangzhou needed to pay a certain amount, sharing the rest of the revenue with the provincial authority. Similar schemes were in turn copied by city and county governments, who arranged fiscal relationships with their subordinate bodies. As a result, the fiscal contracting system greatly strengthened the link between local revenue and expenditures, and gave local governments at all levels the authority and incentives to develop their local economies because the revenue they were able to retain was closely linked to local economic prosperity (Qian, 1999). As state-owned industries were weak in Guangdong, local governments could either support the development of the local non-state sector (e.g. township village enterprises, TVEs), or attract industrial investments from overseas. With increasing decentralisation during the 1990s, local governments in Guangdong recognised that since their TVEs had generally become uncompetitive, greater returns could be made by attracting foreign investment and technology.

The concept of SEZs was later expanded to various types of development zones, offering different kinds of incentives and benefiting from different levels of autonomy. Similar to SEZs, the 14 open coastal cities that were established in China in 1984, including 2 in Guangdong (Guangzhou and Zhanjiang) upon the State Council's approval, can also set up "development zones" inside their regions to implement more liberal policies for attracting foreign capital and technology (Qian, 1999). In fact, development zones could be set up with designations from both central and provincial levels. Central government-designated "development zones" include economic and technological development zones (ETDZ), high-tech development zones (HTDZ), free trade zones (FTZ), and export processing zones (EPZ), most of which are located in SEZs or open coastal cities. There has also been a flourishing of central government-designated industrial development zones in Huizhou, Zhongshan and Foshan (in the

PRD), as well as provincial government-designated development zones across the whole province (Box 3.1). Figure 3.1 shows development zones designated by both the central and provincial governments across Guangdong, illustrating a generic distribution pattern of investment attraction in the province. Central and provincial government-designated development zones are important to investment attraction. For instance in 2007, they accounted for 30.9% of provincial FDI, hence 20.3% of provincial industrial value added, and 21.9% of provincial goods export (Guangdong Bureau of Investment Promotion – GDBIP, 2009). Moreover, these data have not taken into account most of the industrial relocation parks designated by the provincial government, or a very large number of industrial parks established by municipal, town, township governments.[1]

Figure 3.1. **Central and provincial government-designated development zones and industrial parks in Guangdong by core industry, 2009**



Source: Official Catalogue of China's Development Zones (2006), reviewed and authorised by NDRC, Ministry of Lands and Natural Resources, Ministry of Construction (State Bulletin 2007 #18).

Box 3.1. Central and provincial development zones in Guangdong

Guangdong is the province where development zones have been flourishing since the early period of the "Open Door" policy. Dating back to 1984, Guangzhou ETDZ was among the first economic and technological development zones approved by the State Council. Up until the end of 2008, there were 25 development zones designated by the central government, and 69 development zones designated by the Guangdong provincial government.

Development zones designated by central government

One of the main aims of an **economic and technological development zone** (ETDZ) is to favour the attraction of FDI in harmony with local firms, to offer incentives for the introduction and diffusion of advanced technologies, as well as to support the use of advanced managerial techniques. Since many ETDZs have developed for years through attracting and utilising foreign capital, they have built up infrastructure to ensure that their investment environment is generally in line with international standards. Years of growth of domestic investment have become another critical source of ETDZ's investment attraction.

A **high-tech development zone (HTDZ)** is specifically aimed at favouring firms using new technology to increase the value added of their products. Its administrative body will implement various nationally designated high-tech related preferential policies such as tax reduction and exemption, and improve supporting services to firms. In order to strengthen the development of these areas, the Guangdong provincial government has introduced specific programmes to foster research and development in high-tech sectors.

A **free trade zone (FTZ)** is similar to the internationally accepted concept, which is an area where international trade and bonded business are conducted. Foreign investors are allowed to invest and operate international trade, develop bonded warehousing, conduct export-oriented processing in the zone. An **export processing zone (EPZ)** is approved by the central government and managed by the Duty Office. Newly approved EPZs tend to be located in existing development zones, for facilitating management process. Both FTZs and EPZs grant a higher degree of freedom in the import and export of goods, with exemption from specific taxes if re-exported.

Development zones designated by provincial government

While the four concepts discussed above refer to development zones designated by the central government, there are a larger number of development zones designated by the provincial government, including mainly **industrial parks (IPs)**, **economic development zones (EDZs)**, and **high-tech industrial parks (HTIPs)**. Although serving the same purpose of attracting investment, they differ from their central government counterparts in the following ways: i) they offer incentive policies granted by the provincial government; ii) they distribute across the province, with the additional objective of development in the lagging non-PRD region.

Source: GDBIP (2009), "Recalling Development Zones in Guangdong province", *www.gdbip.org.cn/Article/ShowArticle.asp?ArticleID=742*, in Chinese; China Association of Development Zones, *www.cadz.org.cn/en*, accessed 5 July 2010.

The various development zones have given local governments the leverage to provide incentives for both foreign and domestic investors, including fiscal incentives, low-cost land, better physical infrastructure, and relatively flexible administrative procedures, etc. Specifically:

- **Fiscal incentives** involve five types of taxes: income tax, turnover tax, value-added tax (VAT), import duties and local tax. Up until the end of 2006, fiscal incentives were specifically granted to foreign investors and not to their Chinese domestic counterparts, i.e. foreign-invested enterprises paid an average of 15% of their income in enterprise income tax, while domestic enterprises

paid on average 25%. Since the 2007 Enterprise Income Law came into effect on 1 January 2008, there are no longer discriminatory tax treatments between domestic and foreign investments, except to the extent that pre-existing arrangements are being gradually phased out over a 5-year transition period in ETDZs. Enterprise income tax incentives still hold for sectors the government wishes to promote, such as environmental protection and renewable energy (e.g. 15% for state-encouraged high-tech enterprises) (OECD, 2008b). Turnover and value-added taxes are determined by the central government, but the local tax (3%) is levied at the discretion of local governments, and is often reduced or eliminated as a means to compete with other local governments for investment attraction. Duty exemptions are also granted to imports in the case of export-oriented industries. Tax rebates for exports vary – and have been used as a policy alternative to varying the exchange rate for the purpose of encouraging exports.

- **Land** is another important cost and location determinant for foreign investment. Local governments are generally given the authority to make land grants (a lease period of up to 50 or 70 years) and to determine land-use fees. The cost of land and the conditions of land grants have thus become a strategic tool in policy competition for FDI among local governments.
- **Physical infrastructure** was also developed by local governments to attract FDI. A growing number of local governments have resorted to "BOT" (build, operate, transfer) agreements with foreign companies.
- **Flexible administrative procedures** were introduced to improve efficiency in the approval process, including the provision of "one-stop" or "one-street" procedures and performance pledges. The results of these pledges still vary considerably, however, because they depend heavily on administrative effectiveness (Oman, 2000).

Some areas host more than one type of development zone. For example, Guangzhou Luogang District hosts four central government-designated development zones, including an economic and technological development district (GETDD), an export processing zone (GEPZ), a high-tech development zone (GHTDZ) and a free trade zone (GFTZ). The level of incentives varies depending on the types of development zones (Table 3.1).

Whilst the development zone policies have been successful in attracting investment, especially within the PRD, implementation at a larger scale has started to produce inefficiency, agricultural land loss and chaotic development of the region. There were numerous industrial development zones approved by the central and provincial governments, or established by municipal, town and township governments in Guangdong. As their expansion mainly took the uncontrolled sprawling form, massive agricultural land was wasted when transformed to industrial use. The intrinsic reason is the alignment of interests between local governments and real estate developers. Given the inter-governmental system of fiscal roles and responsibilities, especially since the 1994 fiscal reform,[2] local governments depend on land-related revenues as a principal resource to finance the level of public service requested and promote further economic development.[3] Therefore, municipal governments have had a strong incentive to acquire and convert agricultural land to constructed land. Though the central government recognised the problem and implemented diverse policies such

as introducing a land conversion quota system and establishing the Land Supervision Bureau, ineffectual policy implementation at the local level has been a continuing problem (Kamal-Chaoui *et al*., 2009). Conflicting interest between central and local governments made the former sometimes take forceful action to strengthen enforcement (OECD, 2010b). Since 2003, the Chinese central government has started a nationwide programme to close down development zones considered illegal by the central government. Under this programme, development zones have been closed down due to: *i)* illegal conversion of agricultural land into speculative development zones; *ii)* low occupancy rates and limited industrial investment; or *iii)* preponderance of polluting industries avoiding more stringent regulatory oversight in urban areas. As a result, the number in Guangdong was reduced from more than 500 in 2003 to 92 in 2007[4] (GDBIP, 2009).

Table 3.1. **Incentives and policies favouring Guangzhou development zones**

	GETDD	GHTDZ	GEPZ	GFTZ
Status	Centrally designated development zone	Centrally designated development zone	Centrally designated development zone	Centrally designated development zone
Duty and VAT for self-use equipment and spare parts	Exemption for those who belong to "encouraged industries", which are determined by the central government of China		-Exemption	
Duty and VAT on office appliances	No exemption		-Exemption	
Duty and VAT on raw materials and parts	Exemption for processing trade enterprises only		-Exemption	
Licenses for equipment, raw materials and office appliances of processing trade	Free of license only for processing trade of "encouraged industries"		Free of license for all processing trade projects	
Domestic sales for finished products with duty-free raw materials	Levy on finished products		Levy on finished products	Only levy on imported raw materials and parts
VAT refund for finished products made by domestic raw materials	VAT is refunded after shipment departure of finished products		Immediate VAT refund upon entering the area for domestic raw materials	Refund VAT after shipment departure of finished products
Ratio between export and domestic sale	Decided by investors as long as their projects are in compliance with national industry guideline and are excluded from export license and quota management. High flexibility for the ratio between export and domestic sale		More than 70% export required	No restriction
Guarantee deposit system	Conduct the system by categorising enterprises into type: A,B,C,D		Not available	
Rate of VAT	13% (agriculture-related projects), 17%			
Rate of real estate tax	Exemption for three years		Exemption for three years	
	Exemption for five years for high-tech companies, 1.2% afterwards		Exemption for five years for high-tech companies	

Source: Guangzhou Economic and Technological Development District (GETDD) (2010), *Guidebook of Preferential Policies*, *eng.luogang.gov.cn/public/showArchive/93%7C112.html*, accessed 20 March 2010.

Policies to foster industrial clustering: the specialised towns programme

In the course of industrial development, particular attention has been placed on how to shape the "geography" of Guangdong's industry, and influence the location of firms within the province. Although the spatial agglomeration of firms is mostly a spontaneous process, the Guangdong authorities have decided to accelerate and guide this process through specific policy measures (Box 3.2). With the slogan "one town one product", the Guangdong government launched a programme in 2000 to promote the development of the so-called "specialised towns" (STs): spatial agglomerations of enterprises all focused on the production of one specific item (or of a limited range of similar products, or of part of it, or in the same sector). These STs differ from general industrial agglomerations, because they all receive official government recognition which is based on specific criteria and linked to specific firms and town-level incentives. The recognition is both an industrial development policy instrument and a signal for the market. The experience is unique: each potential specialised town is studied by a group of government experts that eventually awards the town the label "specialised town"; a number of financial and preferential policies are granted afterwards to (further) encourage agglomeration and specialisation; government recognition and policy advantages are expected to guarantee competitiveness, innovation and market visibility.

To qualify, specialised towns need to meet the following criteria:

- the town has to be a "township" from an administrative point of view, or, less frequently, a "county" or an "urban district" (they normally do not appear in highly urbanised and industrialised metropolitan regions such as Guangzhou and Shenzhen, which rely more on industrial development zones);
- at least 30% of industrial output (or employment) has to be concentrated in one industry (defined in specific sectoral terms, analogous to our 3-digit classification systems). This industry is called "specialised sector";[5]
- the annual value of the industrial output has to exceed CNY 2 billion (about USD 293 million).

The officially recognised specialised towns are then entitled to receive funding from the Department of Science and Technology and from the local government. This money has to be used mainly to establish an innovation centre, whose aim is to help firms in the development of new technologies and to favour the establishment and consolidation of relations among actors. The idea behind the establishment of such centres is that they allow firms to increase the quality of their products and the town will benefit from an improvement in the reputation of the whole city, possibly developing a common and easily recognisable brand (Arvanitis and Haixiong, 2004; Wang, 2004; Department of Science and Technology of Guangdong Government – DSTGG, 2003; DSTGG, 2006).

Box 3.2. **Pattern of spatial agglomerations in Guangdong: the genesis of specialised towns**

Specialised towns can be located in different areas, including rural villages, medium-sized cities, ancient productive systems or suburbs of big metropolis. The development path of these towns varies as well. Some have been driven by the emergence of new firms that could lead the development of the specialised sector and favour the emergence of a localised subcontracting network. Some have been pushed by the privatisation of township and village enterprises. In other cases, specialised towns have emerged thanks to local capacity to attract FDI and to favour the relations between foreign firms and existing enterprises. They could also be driven by domestic private and public large enterprises, or a prevalence of SMEs that co-operate with each other and where there are no leading actors.

The support to specialised towns began at the end of 1980, when the Chinese government launched the "Spark Plan". The programme aimed to increase the technological innovation capacity in several rural areas of China, with the idea that strengthening the innovative capacity of the agricultural sector would have positive spillover effects on the whole economy, therefore favouring a parallel growth of industrial production. The "Spark Plan" also foresaw the creation of several investment areas, the so-called "Spark technology investment zones", where firms could benefit from the availability of funds coming from government and bank loans. These investment zones represent the seed from which several Guangdong specialised towns originated. It is, for example, the case of Datang, in Shaoguan prefecture, Zhangcha and Pingzhou in Foshan prefecture and Fenxi in Chaozhou prefecture.

In particular, while studying these investment areas, some Guangdong experts and officials realised that in most cases each area tended to specialise in a specific sector, what has been called "one town one product". These studies and some analogous successful international cases of industrial agglomeration (such as industrial districts, firm clusters, local systems of innovation, etc.), have been the basis for a new strategy. Guangdong policy makers started to design measures to actively support these industrial agglomerations, in particular those initiatives designed to increase the innovative capacity of firms. Given that the town was the prevailing administrative unit among these agglomerations, they were defined as specialised towns. In this framework, in 1998 the Department of Science and Technology of Guangdong launched a specific programme to support a first group of specialised towns that in a second phase was extended to several other cities.

Source: Di Tommaso, M.R. and L. Rubini (2006), "Cluster industriali e specialized towns nel Guangdong: la centralità del Delta del Fiume delle Perle", in Di Tommaso, M.R. and M. Bellandi (eds) (2006), *Il Fiume delle Perle: La dimensione locale dello sviluppo industriale cinese e il confronto con l'Italia*, Rosenberg & Sellier, Torino, Italy.

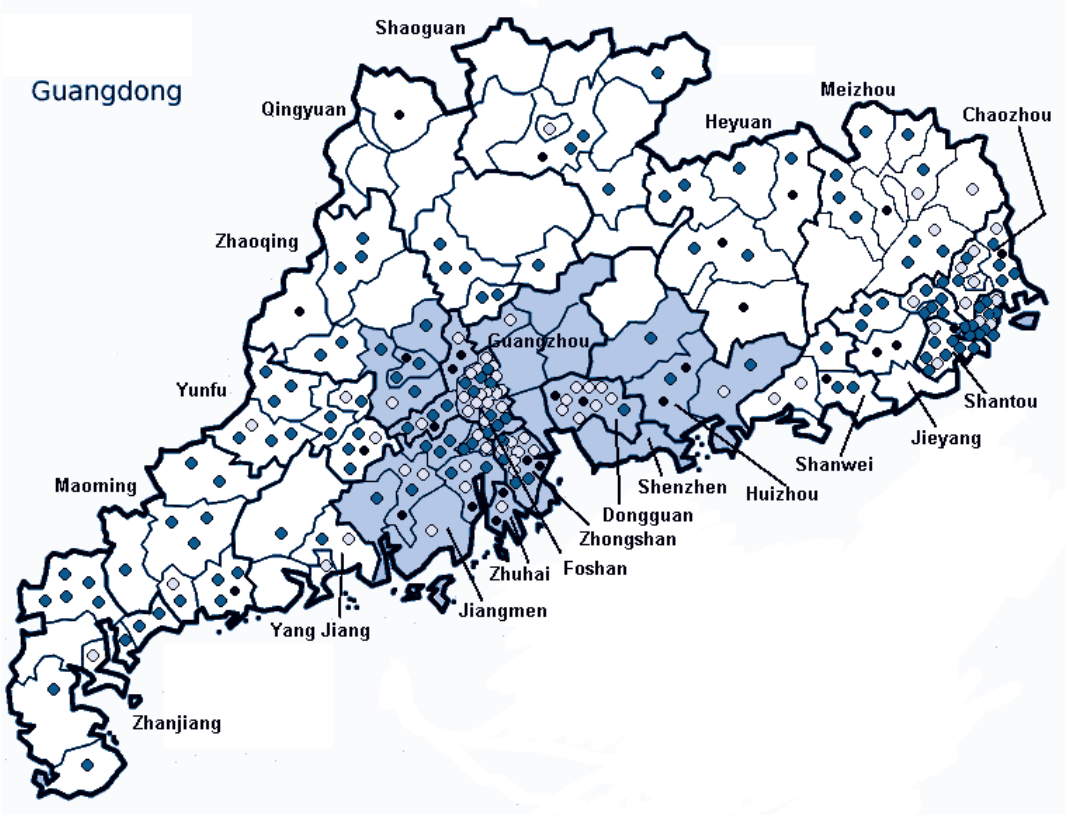
The implementation of the Specialised Town Programme has given rise to a steady growth of specialised towns in Guangdong (Figure 3.2). The total number of specialised towns reached 277 in 2008 up from 21 in 2001 (Table 3.1). Specialised towns have also gained economic importance over the years: in the time span of only 7 years (2001-2008), they have come to represent almost 25% of total provincial GDP, from 4.14% in 2001. The growing performance has been coupled with an impressive increase in the total number of firms (from 39 200 in 2001 to more than 42 860 in 2008) and in the number of firms in specialised sectors (from 14 800 in 2001 to 122 700 in 2008). The number of high-tech firms and S&T staff has increased by almost 2 100% and 600% respectively; and there has been a steady growing flow of local government funds directed to science and technology and an amazing boom in the number of patents, reaching more than 100 000 in 2008 up from 2 852 in 2001.

Table 3.2. **Key statistics on specialised towns in Guangdong**

Year	2001	2002	2003	2004	2005	2006	2007	2008
Number of STs	21	50	71	103	159	201	228	277
% of provincial GDP	4.14	8.32	10.77	14.22	21.47	23.24	24.94	24.49
Population (10 000)	148	351.5	549.9	850.3	1 358.1	1 708.63	2 037.24	2 644.74
% of provincial population	2.0	4.6	7.1	10.9	17.2	21.2	25.0	27.7
Number of firms (10 000)	3.92	9.79	13.47	16.4	23.9	36.66	41.39	42.86
Number of firms in specialised sectors (10 000)	1.48	3.39	4.3	4.8	10.1	12.2	10.33	12.27
Industrial value of specialised sectors (CNY 100 million)	422.45	1 271.38	1 780.27	2 693.65	4 683.1	5 607.37	9 731.36	9 777.68
Number of science and technology staff (10 000)	10.69	18.78	26.01	48.16	42.24	45.24	61.36	76.9
Number of high-tech firms	68	257	336	513	688	971	1 222	1 517
Financing of town government to science and technology (CNY 10 000)	13 527	29 525	41 132	60 004	61 283	46 738	65 544	98 606
Accumulated patents	2 852	16 289	23 006	46 101	49 285	68 964	108 416	11 642

Source: CIRLP database, University of Ferrara [6]; Guangdong Science & Technology Statistics, *www.sts.gd.cn/show.asp?ArticleID=568*.

Figure 3.2. **Overview of specialised towns in Guangdong province**



Note: Shaded area indicates the Pearl River Delta counties.

Source: *CIRLP database*, University of Ferrara.

This growth is not only a result of the formal acknowledgement of STs, but also relevant government-supported policies. Since 2000, the Guangdong Department of Science & Technology has designed policy measures that intend to harness all the benefits arising for firms from their agglomeration, from their proximity and co-operation, as well as from forms of joint action and collective supporting services.[7] These policy measures follow three main policy lines:

- **Promotion of the innovative capacity of traditional sectors.** This line mainly targets those towns specialising in traditional, labour-intensive productions. In this case the objective is to increase co-operation among firms to conduct joint research on commonly required core technologies, with support from provincial, municipal and township levels of governments (e.g. preferential treatment in government procurement) and research institutions or universities (e.g. collaborative alliance between firms and research institutes or universities). An additional objective is to improve the quality of labour, which is mainly low skilled.
- **Promotion of high-tech industries.** Despite an almost 1 700% growth rate over 2001-2008, the number of specialised towns focusing on high-tech sectors is still limited, and most of them are heavily based on foreign firms. For these reasons, some specific *ad hoc* measures are necessary. According to the Department of Science and Technology, the main limit of the existing high-tech specialised towns is not a low technological level, but the fact that technology is controlled by foreign-funded multinationals. Therefore, the main challenge for the government is to foster their embedding in the locality: in this way it will be easier to control the technological potential that arises from them. The main actions to be implemented, in this case, are the encouragement of collaboration relations among local and foreign firms (e.g. joint research projects or setting up branches in specialised towns) and the promotion of capital sharing initiatives.
- **Promotion of the birth of new towns in rural and mountainous areas.** Particularly since 2005, the efforts of the Department of Science and Technology of Guangdong province have been devoted to decrease imbalances in the industrial development among the various prefectures. This has been done by formally recognising new specialised towns in rural areas, especially in resource-based and agriculture-related sectors.

In recent years, the Specialised Towns Programme has been targeting lagging regions outside the PRD, in line with the guidelines of the "Double Relocation" policy. While in 2003, 62% of specialised towns were located in the PRD and close to Hong Kong, China and the special economic zone of Shenzhen, in 2008 only 40% of officially recognised specialised towns were in the PRD. In the second phase (2003-present), the provincial government acknowledged the majority of new specialised towns in the prefectures of Zhanjiang, Jieyang, Heyuan and Qingyuan that are not part of the Pearl River Delta. The eastern part of the province then hosts another clear concentration of specialised towns, close to the Shantou SEZ (Table 3.3). Moreover, there is a negative correlation between the number of new towns recognised and the density of firms of the prefecture which shows that the Specialised Town Programme is directed towards areas outside the PRD with the lowest firm density, e.g. the rural areas with the lowest level of GDP. Trends of specialised towns over 2003-2008 suggest a decrease in the number of towns specialised in low-tech sectors

(from 48% of the total specialised towns in 2003 to 32% in 2008). This decrease was mainly due to a shift towards agriculture and resource-based products (Figure 3.3). At the same time, slow growth in the number of specialised towns in services and tourism as well as in high-tech sectors can be observed (from 1% to 4% and from 8% to 10% of the total of specialised towns respectively).

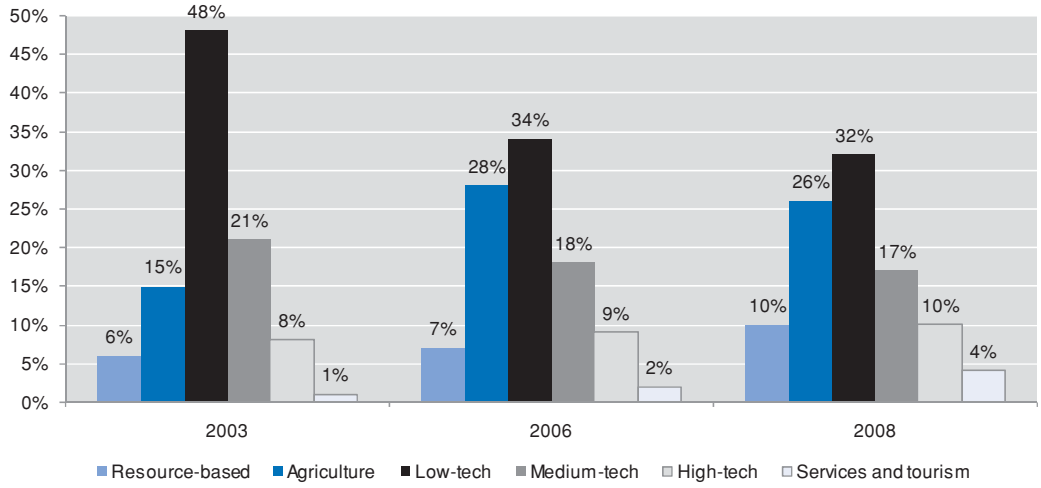
Table 3.3. **Key statistics of specialised towns in prefecture-level cities in Guangdong**

Prefecture	PRD	% change in acknowledged STs 2003-2008	Firm density** 2003
Heyuan	No	600%	0.011
Qingyuan	No	600%	0.015
Shaoguan	No	500%	0.020
Meizhou	No	333%	0.022
Shanwei	No	200%	0.031
Yunfu	No	433%	0.042
Maoming	No	500%	0.045
Zhanjiang	No	1000%	0.046
Yangjiang	No	100%	0.047
Jieyang	No	1 000%	0.090
Chaozhou	No	116%	0.160
Shantou	No	283%	0.492
Zhaoqing	Yes	550%	0.055
Huizhou	Yes	500%	0.075
Jiangmen	Yes	100%	0.228
Zhuhai	Yes	200%	0.512
Guangzhou	Yes	0%	0.633
Dongguan	Yes	57%	0.810
Foshan	Yes	120%	0.865
Shenzhen	Yes	0%	1.149
Zhongshan	Yes	62%	1.387

Source: *CIRLP Database*, University of Ferrara.

The increased focus on higher technology and services sectors reflects the wish to diversify the production specialisation of Guangdong. For instance, the logistics and service sectors emerge in Changping, Zhangmutou and Shatian in Dongguan prefecture (Inner PRD); Henshan in Zhanjiang prefecture specialises in transport (western Guangdong); Qiaotou in Zhaoqing (Outer PRD), Lubao in Foshan (Inner PRD), Tangkou in Jiangmen (Outer PRD), Liuzu in Yunfu (northern Guangdong), He'herkou, Fenghuang and Guanyu in Zhaoqing (Outer PRD) prefecture see instead the emergence of towns specialised in tourism. Within the medium-tech specialised towns, there is an increase in machinery manufacturing and chemical production, while in the high-tech sector, electronics still accounts for the majority of specialised towns, although some new specialisations are emerging in pharmaceutical chemistry. Despite this increase, the focus on higher tech sectors, the so-called "traditional" specialisations, remain at the core of the province's industrial development, in co-ordination with the emerging ones. For example, there are low-tech specialised towns that continue to focus on textiles/clothing, ceramics, furniture, metal products and leather articles, while new ones emerge in the handmade processing of bamboo, wood, or in the production of Christmas articles, mainly directed to foreign markets. Furthermore, there are agricultural-related towns specialising in the cultivation and processing of tea, fruit and vegetables and fishery.

Figure 3.3. **Distribution by sector of specialised towns in Guangdong, 2003-2008**



Note: The 277 towns of the CIRLP database have been grouped into 6 different categories, 4 referring to the UNIDO classification: resource based, low tech, medium tech and high-tech; 1 referring to the agricultural sector and 1 referring to the tertiary sector with a particular reference to services and tourism.

Source: *CIRLP database*, University of Ferrara.

Whilst the "one-town, one-product" programme of specialised towns shows several elements of interest as a tool to promote industrial development, territorial re-balancing and technological upgrading, the recognition of more than 200 specialised towns over a 10-year period has revealed some limits, including:

- **Heterogeneous reactions to policy indications.** After the formal recognition of the town, provincial and local governments usually provide funds for the establishment of *ad hoc* centres for innovation support serving all firms in the ST. However, in some cases these innovation platforms are struggling to emerge because of specific reactions of firms operating in the specialised town. In particular, on the one hand large firms tend not to use the services provided by the innovation centre because they have their own internal resources, while on the other hand, small firms tend to be sceptical about the usefulness and safety of external resources, especially in the period immediately following the establishment of the innovation centre. This scepticism is also fed by the fact that the regulation for the protection of intellectual property rights is still insufficiently clear, which tends to inhibit the innovative capacity of the specialised town. Finally, it has to be underlined that in some cases the publicly-funded innovation centres appear to be inadequate, semi-isolated, inefficient or at least under-utilised.[8]

- **Lack of co-ordination at regional level.** The rapid and continuous growth of specialised towns has caused overlap and "duplications" within the Guangdong territory: there are in fact several towns specialised in similar products that are now competing with one another. In particular, there seems to be an insufficient capacity to develop whole productive chains: in many cases specialised towns are not only operating in the same industrial sector, but they

also concentrate their activity on the same specific phase of the productive process, with frequent horizontal linkages among competitors (Li & Fung Research Centre, 2006). The provincial industrial system as a whole would instead greatly benefit in terms of competitive capacity from a vertical specialisation. This implies the necessity to encourage the towns specialising in similar sectors to concentrate each on a specific phase of the production process (from the manufacturing of machineries, to the production of specific parts, the assembly of the final products and commercial services). This structure allows vertical relations among towns (e.g. among suppliers and customers and not among competitors) to develop, decreasing intra-provincial competition.

- **Problems due to rapid and insufficiently controlled development.** Some specialised towns, and in particular those located in the Pearl River Delta, have experienced incredibly rapid growth in these last few years, and not enough attention has been paid to the regulation of this growth. This has created a series of new problems in terms of congestion, land scarcity, increasing labour costs, pollution, etc. (e.g. lamp production in Guzhen town). An increasing number of specialised town governments are now planning specific policies to tackle these recently emerging difficulties.
- **Insufficient number of specialised towns focusing on the high-tech sector.** Despite their increase, the absolute number remains limited. According to the Department of Science and Technology, the main limit of the existing high-tech specialised towns is not a low technological level, but the fact that technology is controlled by foreign-funded multi-nationals. The main challenge for the government is to foster their embedding in the locality: in this way it will be easier to control the technological potential that arises from them. The main actions to be implemented, in this case, are the encouragement of collaborative relations among local and foreign firms and the promotion of capital-sharing initiatives.

Faced with these difficulties, policy makers in the Guangdong Department of Science and Technology, in charge of the design and implementation of the "one-town, one-product" policy have been encouraging local governments of specialised towns to play a more active role through a number of guidelines. These include the promotion of the development of intermediate institutions, e.g. bodies providing services to all of the firms of the specialised town and *ad hoc* information networks for a better circulation of knowledge especially for small and medium-sized firms; investment in research activities and training programmes and the development of relations among firms and with higher education institutions for technology transfer. Trade fairs are seen as a tool to increase the visibility of the specialised towns, and local governments often invest very heavily in the organisation of these big events.[9] This approach marks a shift from the old direct support to firms to one that addresses the enabling environment firms can benefit from.

3.2. A shift in strategy?

Guangdong as viewed in the main strategic policy documents

While Guangdong still featured prominently in the Chinese central government's regional development strategy in the beginning of the new millennium, the province has recently been losing momentum in national priorities. National directions have been articulated by the most senior Chinese central leaders on several occasions, and documented in the national Five-Year Plans (FYP). In 2000, then-President Jiang Zemin visited Guangdong and encouraged the provincial government to create new competitive advantages, further promote economic growth, and to be the first province in China to reach full "socialist modernisation". In the spring of 2003, President Hu Jintao visited the province and designated Guangdong as the "leading pilot" in the national process of becoming a "*xiaokang*"[10] society, i.e. a modern society in which most people are moderately well off and middle class, but in which economic advancement is not the sole focus of society. In the National 11th FYP, Guangdong is encouraged to foster competitive "city economic zones" (**metropolitan regions**) and "city clusters" (urban clusters) in the Pearl River Delta. The PRD, together with the YRD, and the Beijing-Tianjin corridor, have been identified as regional anchors that should take the lead in promoting regional urbanisation and in forging the comprehensive competitiveness of city clusters. However, the 11th FYP also suggested that Guangdong is losing its momentum to achieve these objectives. Its chapter on "Promoting Balanced Regional Development" explicitly mentioned Shanghai-Pudong in the Yangtze River Delta, Binhai (a new economic zone in coastal Tianjin to anchor the Bohai Gulf), and the Taiwan Straits Development Zone in Fujian as national priority regions. Significantly, the central government did not include the Pearl River Delta as a national priority since it was apparent that, by 2006, the region had – for the first time since the start of market reforms – encountered serious economic difficulties. The main reason is believed to be Guangdong's large percentage of low value-added processing trade and the slow pace of economic upgrading, neither of which is consistent with the national objectives of industrial upgrade.

The Provincial 11th Five-Year Plan translated the direction set at the Chinese central government level into detailed development goals, declaring Guangdong as a leading national pilot "to establish the *xiaokang* society and realise socialist modernisation". Against this ambitious vision, the plan established the development goal of a 9% annual growth rate such that per capita GDP doubles from its level in 2000 to reach USD 4 250 per capita in 2010, and to double again by 2020 to USD 8 500 per capita. The plan also called for the PRD to be "basically modernised" by 2010; for the Eastern and Western Regions to "step into rapid growth"; and for the Northern region to "reach a new stage in development"[11]. By 2020, all of Guangdong will have achieved "socialist modernisation", according to the plan.

Some specific orientations were detailed as follows:

- **Innovation capacity** is to be improved by strengthening the role of Guangzhou and Shenzhen as innovation centres for the province and the PRD and by providing specific assistance to firms to encourage innovation, e.g. subsidies and tax breaks.

- **Regional disparities** reduction objectives reflect the idea that while the PRD region should upgrade to a higher value-added economy, the development speed of lagging regions should be accelerated through: *i)* further co-operation of the Eastern, Western, and Northern Regions with the PRD; *ii)* implementation of differentiated policies for the three regions; and *iii)* relocation policies of the PRD industries to the lagging regions.
- **Green development** reflects the province's move to tackle chronic environmental problems, recognising that the original pattern of industrial development could not be sustained given the current environmental capacity, including limited energy resources in a context of high total energy consumption and energy prices, and limited available land in the Inner PRD, as well as the polluted natural environment.
- On the **institutional and governance** side, more emphasis was put on external co-operation rather than internal co-ordination, including with: *i)* Hong Kong, China and Macao, China through cross-border infrastructure development projects and other sectoral co-operation (e.g. logistics, tourism, finance, producer services, R&D, education, culture, health, information, environment, and trade); *ii)* through the Pan Pearl River Delta[12] – an economic zone that includes Guangdong, its neighbouring eight provinces, and the two SARs – especially in transport (expressways, rail, ports, airports) to upgrade accessibility to a wider market; and *iii)* within the ASEAN.[13]
- Although the document mentioned that the PRD should also "promote co-ordination and co-operation between cities, and consolidate elements of natural resources, infrastructure, and existing industrial assets", the concept of "PRD integration" has not yet emerged.
- A departure in the 11th FYP from its predecessors was its approach to **infrastructure**. The 11th FYP called for investment in infrastructure that meets future needs, not only current requirements. For the past two decades, infrastructure construction has been almost consistently overtaken by unforeseen demand. The highest priority infrastructure defined in the plan are highways and expressways, regional rail transit, inland waterways, intermodal rationalisation of container transport, energy transport, and aviation.
- The plan emphasised the need to promote balanced economic growth of both export- and domestic-oriented economies.

While the PRD disappeared from the priority list in the National 11th FYP, the central government released the "Outline of the Plan for the Reform and Development of the Pearl River Delta region 2008-2020" ("Outline for PRD") in 2008.[14] Economic difficulties in the PRD had become serious as of 2007, and implementation of the Provincial 11th FYP had lost momentum. The "Outline for PRD" significance lies in making the PRD again a national development priority, in the same line as it was provided to the YRD region with the "Guiding Opinions" in 2008.[15] Prepared by the National Development and Reform Commission (NDRC), the macroeconomic management agency under the Chinese State Council which has broad administrative and planning control over the Chinese economy, the "Outline for PRD" gives the Guangdong provincial government an explicit mandate for experimentation and reforms. It came at a time when Guangdong's manufacturing (especially the processing trade sector) encountered severe economic difficulties caused by rising labour costs,

limited availability of land, and the financial crisis which aggravated the economic situation. It was the first time in China's history that the State Council issued a sub-provincial regional development strategy, giving the plan significant national importance. One of the main implications of such recognition is that sub-national governments within the Greater Pearl River Delta have greater leeway to engage in direct dialogue and collaboration.

Key specific feature of the "Outline for PRD" include:

- **The PRD as a pilot and experimental region in China.** Compared to the Chinese national strategy for YRD, the document for PRD stressed Guangdong's positioning as a "pilot region for further reforms" and an "experimental region for the pattern of scientific development" in addition to those similar positioning terms in the national YRD strategy. Guangdong is thus expected by central leadership to take more initiatives and conduct more pilot programmes. Growth target objectives have been mentioned as follows: "per capita GDP is targeted to reach CYN 80 000 by 2012 and CYN 135 000 by 2020".

- **Upgrading industry and strengthening innovation capacities are at the core of the new strategy.** The PRD is expected to become the main innovation centre in the Asia-Pacific region and Guangzhou and Shenzhen are expected to emerge as two of the leading national high-tech industrial development areas in China. The strategy has reiterated the importance of introducing higher value-added industries, including developing modern services sectors (e.g. finance, expo and logistics), advanced manufacturing sectors (e.g. automotive and petro-chemicals), high-tech sectors (e.g. electronic communications industries and biotech industries), traditionally competitive sectors (e.g. textile and footwear) and a modern agriculture sector. Key quantitative targets set are that by 2020, modern services and advanced manufacturing sectors should account for 60% service sector growth and 50% of industrial sector growth, respectively. By 2012, R&D expenses will account for 2.5% of the regional GDP, the number of researchers will reach 280 000, some 100 state laboratories for engineering innovation and research and development will be set up; and 3 to 5 industrial clusters powered by high-tech will go into operation.

- **Improving spillover to peripheral PRD regions as a means to reduce regional disparities.** The concept of spillover was mentioned in the Guangdong 11th FYP, but in a relatively vague way. Conversely, the new strategy emphasised the concept through an explicit policy, the "Double Relocation" Policy, as an important mechanism to achieve the goal and foster closer co-operation between the PRD and the Eastern, Western, and Northern Regions. As will be developed below, the "Double Relocation" policy applies to both the relocation of industries and the labour force with the objective of upgrading local industries in the PRD from labour-oriented and low value-added to high value-added and highly technical industries while encouraging the development of lagging regions.

- **Engaging in major infrastructure development.** One thousand eight hundred sixty-four miles of highways are to be built by 2012 and railways will be expanded 683 miles by 2012 and 1 367 miles by 2020. By 2020, an efficient

and convenient public transport network linking both the rural and urban areas will be operational in the PRD, and a standardised system of public services will be established throughout this region. Objectives also include the construction of a clean, safe and reliable energy supply system in the PRD: Guangdong is due to be developed into an important national base for nuclear power and nuclear equipment manufacturing.

- **Fostering social development and urban-rural linkages.** A comprehensive medical care system and health service is expected to be developed in the PRD that should benefit all citizens (urban and rural) by 2020; the pension system is to cover at least 95% of urban workers, 80% of migrant workers and 60% of rural residents by 2012; and 80% of the area is to be urbanised by 2012 and 85% by 2020; the actual urbanisation rate in the PRD reached 80% in 2008 (Guangdong Bureau of Statistics, 2009).
- **Increasing environmental protection and enhanced resource conservation, including land and energy resources.** Quantitative targets are: by 2020, energy consumption per unit of GDP in the PRD will be reduced to 0.57 tons of standard coal equivalent. The rate of reusable industrial water will achieve 80% of total industrial wastewater, whilst 90% of wastewater and 100% of urban wastewater will be disposed of harmlessly. The issue of climate change has not yet been mentioned.
- **Increasing collaboration with SARs (Hong Kong, China and Macao, China) as a way to deepen regional integration.** As Guangdong and its PRD region have already been highly linked with SARs economically (e.g. through processing trade), the efforts focus on exploring mechanisms to further collaboration across the SARs under the "one country, two systems", with priority given to the financial sector. The main change concerns the increased autonomy in the collaboration discussion between Guangdong, Hong Kong, China and Macao, China, while before three parties needed to go to the central government (National Office for Hong Kong and Macao Affairs) for approval in many collaboration discussions.
- **Governance as the key theme for experimentation.** Differing from the Guangdong 11th FYP, and with the backing of the national government, the Guangdong government now has the mandate to push for radical changes to institutional structures and mechanisms that impede effective regional co-ordination. Two initiatives raised in the new strategy for the PRD are now being implemented: *i)* the dismantling of the decades-old "city controlling county" system whereby counties and county-level cities report to a prefecture-level city; and *ii)* inter-municipal co-ordination, beginning with Guangzhou and Foshan.

The current policy framework

As expressed in the main provincial strategic documents, two issues stand out as key challenges in policy making circles:

- **How to reduce territorial imbalances through the development process:** some regions are characterised by particularly high growth rates, relevant firm density, constant flow of foreign capital, attraction of labour force from other

regions, etc. Other parts of the province, on the contrary, still lag far behind and struggle to emerge.

- **How to re-strengthen industrial competitiveness:** apart from the different industrial development levels, Guangdong's industry is now facing increasing competition, from both domestic and international arena; policies should be adjusted to support its competitiveness.

The "Double Relocation" policy

Launched in May 2008, the **"Double Relocation" policy** (DRP) has been the provincial government's main policy response to address the issue of regional disparities in Guangdong (Guangdong Provincial Government – GDPG, 2008a). The objective of the DRP is twofold: *i)* to bring order to the PRD congested area; and *ii)* to stimulate development in lagging peripheral territories of Guangdong. The DRP is composed of two main actions (Li & Fung Research Centre, 2008):

1. Moving the labour-intensive, resource-consuming processing industries from the central PRD to less developed areas, such as northern Guangdong and western and eastern PRD;
2. Favouring the relocation of labour from agriculture to the secondary and tertiary sectors, to concentrate the skilled labour force in central PRD. This is seen as a way to favour the technological upgrading of industry in the central PRD area.

Targets of the DRP are: by 2012, to absorb 6 million rural surplus labourers into the non-farming sector, and to train 3.6 million of Guangdong's rural workers with basic skills for employment in the industrial sector. The Guangdong provincial government hopes to use the DRP to increase the provincial non-farming employment rate to 80% across the province. The labour-intensive share of manufacturing is expected to be dramatically reduced in the PRD.

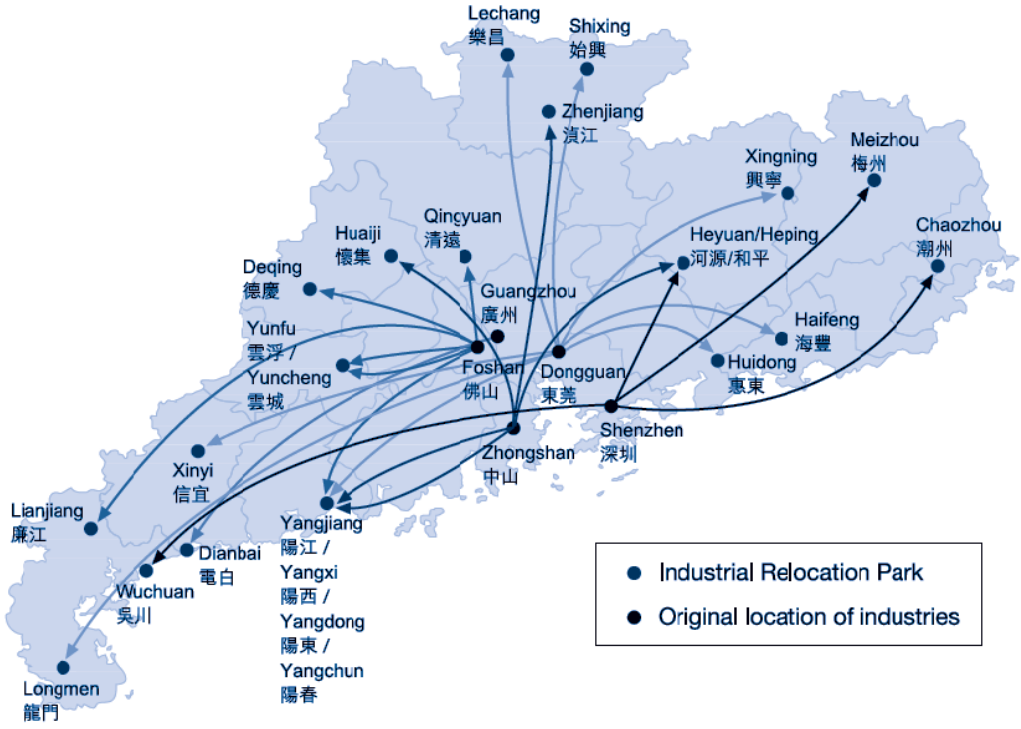
The principal tool for implementing the DRP is the creation of "industrial parks" which aim to attract firms to selected locations in lagging regions. CNY 40 billion (USD 5.7 billion) are allocated for the whole DRP over 2008-2012. Major tasks include: building infrastructure of the industrial parks, providing incentives to firms to relocate and a specific proportion is dedicated to training the labour force in the lagging regions. Specific industry relocation policy measures are:

- The industrial relocation pattern will follow relocation guidelines which are centred on pairing sending and receiving locations (Figure 3.4). Industries relocating from the PRD should mainly be in the pillar industries of the industrial relocation parks (Table 3.4).
- Specific measures should be taken to reduce the operating costs of enterprises relocating to new sites, including preferential pricing of electricity;[16] the Guangdong provincial government will support land provision through land conversion quota allocations to facilitate development of the new parks.
- Governments will support infrastructure development in the new parks through provincial and municipal fiscal measures. More specifically, among CNY 40 billion total budget, an annual amount of CNY 3 billion has been allocated mainly for park infrastructure construction from the provincial

budget. The remaining construction investment should come from sub-provincial governments, mainly PRD municipal governments.

- Environmental protection in parks will be addressed: highly polluting or blacklisted industries are not allowed to relocate to the parks. Firms are required to conduct environmental impact assessments that satisfy the environmental standards of the park.

Figure 3.4. **Sending and receiving locations of Guangdong's "Double Relocation" policy (DRP)**



Source: Li & Fung Research Centre (2008), "China's Industry Relocation and Upgrading Trends: Implications for Sourcing Business", in *China Distribution & Trading*, No. 56, December, pp. 1-16.

Labour force relocation policy measures are mainly for migrant workers from inside Guangdong, with specific measures below:

- To facilitate labour migration from the lagging non-PRD into the PRD, PRD municipalities are partnering with their non-PRD counterparts to increase enrolment in education and training programmes through the "twinning programme". The goal is that at least 30% of new enrolments in PRD schools should be students from lagging non-PRD regions.
- Encourage Guangdong's rural surplus labour to take jobs locally in the new DRP industrial parks close to their places of origin; encourage DRP enterprises to hire Guangdong's rural surplus labour. If hired, the social security payment costs will be subsidised by the provincial government.

Table 3.4. **Industrial relocation parks designated by the Guangdong provincial government**

	Industrial relocation parks	Region	Pillar industries to be relocated
1	Dongguan Dongkeng (Lechang)	NR	Machinery and furniture
2	Dongguan Fenggang (Huidong)	NR	Shoes and household electronic appliances
3	Dongguan Dalang (Xinyi)	WR	Textile and processing of agricultural products
4	Dongguan Dalang (Haifeng)	ER	Electronic information and bio-technology
5	Dongguan Qiaotou (Longmen)	NR	Apparel and furniture
6	Dongguan Shijie (Xingning)	NR	Automobiles and metal machinery
7	Dongguan Shilong (Shixing)	NR	Electronics, precision machinery and equipment
8	Dongguan Changan (Yangchun)	WR	Electronic appliances, clothing
9	Zhongshan (Heyuan)	NR	Telecommunications equipment and machine tools
10	Zhongshan (Zhaoqing Dawang)	NR	High-tech services and leather clothing
11	Zhongshan Sanjiao (Zhenjiang)	NR	Electronic information and machinery e.g. auto parts
12	Zhongshan Dayong (Huaiji)	NR	Furniture and metal products
13	Zhongshan Huoju (Yangxi)	WR	Textiles and garments, food and medicine
14	Zhongshan Shiqi (Yangjiang)	WR	Electronic information, electric appliances
15	Foshan (Qingyuan)	NR	Machinery and pharmacy
16	Foshan Chancheng (Yuncheng)	NR	Machinery and furniture
17	Foshan Chancheng (Yangdong)	WR	Hardware machinery and furniture
18	Foshan Shunde (Yunfu)	NR	Machinery for light industry and telecommunications
19	Foshan Shunde (Lianjiang)	WR	Manufacturing and processing of small household appliances
20	Guangzhou Baiyun Jianggao (Dianbai)	WR	Electrical appliances, textile and apparel
21	Shenzhen Nanshan (Chaozhou)	ER	Machinery and new materials
22	Shenzhen Yantian (Meizhou)	NR	Electronic information, electrification and automation
23	Shenzhen Futian (Heping)	NR	Watches and clocks, electronic and telecommunications equipment
24	Shenzhen Luohu (Heyuan Yuancheng)	NR	Electronic appliances, mobile phones and related products
25	Shenzhen Longgang (Wuchuan)	WR	Electronics and toys
26	Shenzhen Longgang (Shantou Chaonan)	ER	Electronic appliances, clothing
27	Zhuhai Jinwan (Jieyang)	ER	Machinery and bio-pharmaceutical
28	Shunde Longjiang (Deqing)	NR	Lighter (tobacco tools) and furniture

Note 1: Industrial relocation parks are named as the combination of original location and new location (the latter is in parenthesis). For instance, Dongguan Changan (Yangchun) indicates that firms in Dongguan Changan are encouraged to relocate to the industrial relocation park in Yangchun.

Note 2: Acronyms for regions in Guangdong are: WR – Western Guangdong Region, ER – Eastern Guangdong Region, NR – Northern Guangdong Region. For details, see Chapter 1.

Source: GDPG (2008), "Guidelines on the Layout of Industry Relocation Regions in Guangdong province", Guangdong Economic and Trade Commission, No. 385, Guangzhou, China.

- Promote education and skills training: polytechnic education will be provided for free for Guangdong's rural poor, as well as training for rural surplus labour less than 45 years old. It is also expected to upgrade the skills of 1 million migrant workers annually through on-the-job training.
- Establish training services and public job training bases; encourage certification of training institutions; set up incentive mechanisms to keep "excellent" migrant workers, e.g. through providing affordable housing.

Over 2008-2012, of the CNY 40 billion total anticipated DRP investment mentioned above, the Guangdong provincial government will transfer CNY 1.5 billion per year to the 15 PLCs in the non-Inner PRD region (each 0.1 billion per year) to be earmarked for interest subsidies on commercial loans used to finance construction for the DRP industrial parks and other infrastructure. An additional CNY 1.5 billion per year will be split by 3 demonstrating parks each year, and CNY 1 billion will be

earmarked for training programmes for rural workers. Moreover, CNY 0.5 billion per year will be spent on subsidies for firms to upgrade their technologies should they accept to relocate. Implementation of the DRP has been introduced into sub-provincial level annual government employees' performance evaluations, which are based on three criteria: management structure for DRP; policy actions implemented according to DRP principles and requirements; and the progress of relocation. To strengthen municipal governance in lagging regions, PRD municipalities are required to send public servants to work in their "twinned" counterparts for fixed periods.

The "Double Relocation" policy aims to create economic development opportunities in lagging regions and to foster a higher valued-added economic development model in the PRD. The intended effects of the "Double Relocation" policy in the PRD include a reduction in the demand for land resources, an easing of environmental pressures in the already industrialised areas as well as upgrading the quality of human resources (by delocalising lower skilled people to lagging regions and attracting higher skilled labourers from other provinces). In other words, it is an attempt to create a new development platform in the PRD by "emptying the nest for new birds" (Huang, 2009).

Although the "Double Relocation" Policy is the first of its kind in China, territorial relocation in Guangdong started at least one decade ago. In fact, the DRP is only the most recent iteration of an older and broader idea of industrial development (structural adjustment and land-use rationalisation) pursued in Guangdong since early 2000. The older approach is demonstrated, for instance, by the "specialised town programme" (see Section 3.1) in 2000 and the "Co-ordinated Plan for Cluster Development in the Pearl River Delta 2004-2020" in 2003 (Box 3.3). The territorial re-location strategy of industrial sectors foreseen in the Co-ordinated Plan is reinforced in the 10th (2001-2005) and the 11th (2006-2010) provincial Five-Year Plan.

According to the Co-ordinated Plan, the transfer of highly labour-intensive industries should be extended to the inner areas of Guangdong province (Table 3.5). In this way, it will be possible to use the resulting space in Pearl River Delta to increase the number of firms manufacturing higher value-added products, while at the same time promoting the development of typical and handcrafted productions in the internal rural and mountainous areas. To favour such a transfer, a massive investment in supporting infrastructures in less-developed regions (that are expected to catch up with the Pearl River Delta region in terms of per capita GDP by 2010) is foreseen (more than 158 infrastructure projects in total). For example, the plan includes the construction of new rail, water and airline transport systems in the eastern and western parts to be completed by 2010. New large-scale power stations will be built in the coastal areas, as well as new nuclear and wind power plants. Key projects for the different sub-regions are identified in the 11th FYP (e.g. Table 3.6 for eastern Guangdong) as well as core cities in the new development areas (e.g. Shantou, Zhanjiang, Maoming, Shaoguan and Meizhou) (Guangdong International Consultative Conference Preparatory Office – GDICC, 2007).

Box 3.3. The Co-ordinated Plan for Cluster Development in the Pearl River Delta, 2004-2020

The Co-ordinated Plan sets out the main objectives for the industrial development strategy, which is largely based on two pillars of support:

- *i*) sectoral support: identification of the sectors to which most of the support should be directed;
- *ii*) geographic support: identification of the ideal localisation of specific industrial sectors.

In particular, regarding point ii), within the Pearl River Delta, three areas are identified: the "Western PRD", including the prefectures of Zhuhai, Zhongshan and Jiangmen; the "Eastern Pearl River Delta" including Shenzhen, Dongguan and Huizhou; and finally, the so-called "central" prefectures of Guangzhou, Foshan and Zhaoqing.

According to the Co-ordinated Plan guidelines, industries should be re-located according to the different availability of resources that characterise the different parts of the province (with particular reference to the PRD). On one side there is the Western PRD, which still has a good availability of land and human resources and is therefore the best area to host traditional, labour-intensive industries. However, it is worth highlighting that the aim of this area goes beyond the attraction of low-cost firms. The Co-ordinated Plan, in fact, also identifies as a priority in the development of medium- and high-tech sectors, which is supported by the development of new transport infrastructure, most notably additional roadways. In fact, the plan itself aims to develop new transport links in a corridor going from Nansha (Guangzhou) through Zhongshan and Zhuhai to Macao, China, which will run parallel to the more consolidated corridor of Guangzhou-Shenzhen-Hong Kong, China.

Then there are the central areas, which are identified as the best ones to become the financial and tertiary hub supporting the whole Guangdong industry. In line with these indications, in these last few years these central areas have been concentrating their efforts on the development of a wide range of industry-related supporting services relating to trade, funding availability and banking, professional consulting, training, etc. Furthermore, the specialisation of the area towards the tertiary sector goes beyond direct support to firms to embrace improvements in telecommunications, tourism and entertainment in general.

Finally, the Co-ordinated Plan indicates that eastern areas such as Shenzhen and Dongguan, while maintaining their vocation towards exports and continuing to support the development of the already strong manufacturing base built over the years, should at the same time try to promote services linked to manufacturing activity, with particular reference to logistics and transportation.

Source: Greater Pearl River Delta Business Council (2006), "Report on Guangdong Industrial Restructuring: Opportunities and Challenges for Hong Kong, China", available at *www.cab.gov.hk*; Li & Fung Research Centre (2006), "Industrial Clusters in Pearl River Delta", *Industrial Cluster Series*, No. 2, pp. 1-19; Liang, Y. (2009), "Background Briefing of the Outline of the Plan for the Reform and Development of the Pearl River Delta, 2008-2020", speech of Mr. Liang Yaowen, Director General of the Department of Foreign Trade and Economic Co-operation of Guangdong province, 28 April; Barbieri, E., M.R. Di Tommaso and L. Rubini (2009), "Industrial Development Policies in Southern China: The Specialised Towns Programme", in *Economia e Politica Industriale*, 3/2009; Barbieri, E., M.R. Di Tommaso and L. Rubini (2009), *Industria Contemporanea: Governi, Imprese e Territori nella Cina Meridionale*, Carocci Editore, Rome.

Table 3.5. **Priorities for the industrial development of Guangdong, 2001-2010**

Industry	Classification	Foreseen localisation
Electronics and informatics, automotive, mechanics, pharmaceuticals	High-tech, medium tech	PRD
Petrochemicals, paper production	Heavy industry	Coastal areas
Traditional: household appliances, textiles, food, building material	Low tech, resource based	Internal and mountainous areas

Source: Greater Pearl River Delta Business Council (2006), "Report on Guangdong Industrial Restructuring: Opportunities and Challenges for Hong Kong, China", available at *www.cab.gov.hk*; GDICC (2007), "GDICC Update", newsletter for the International Consultative Conference on the Future Economic Development of Guangdong province, No. 14, November.

Table 3.6. **Key projects to be implemented in eastern Guangdong according to the 2006-2010 Development Plan**

Target field	Number of projects	Total investment (CNY billion)
Industry	129	56.3
Transport	26	57.1
Energy	48	110.6
Water conservation	45	13.2
Agriculture	12	1.0
Service industry	32	6.8
Social security	21	2.9
Urban construction and environmental protection	77	23.2
Total	390	270.9

Source: GDICC (Guangdong International Consultative Conference Preparatory Office) (2006), "GDICC Update", newsletter for the International Consultative Conference on the Future Economic Development of Guangdong province, No. 10, November.

DRP is a comprehensive governmental policy to foster a more balanced regional development approach in the province. Experiences in OECD member countries with similar regional policies might provide interesting insights into the effectiveness of this approach. First, similar approaches at directed relocations of economic activity have been tried in a number of OECD member countries in the past with only marginal results. For instance, the Technopolis Programme was introduced by the Japanese government in the 1980s to relocate high-tech industries away from major metropolitan areas to distant non-metropolitan regions (26 sites around small or medium-sized cities), yet its impact on regional development was ambiguous (Box 3.4). In particular, the pace of off-shoring and de-industrialisation in the 1990s resulted in a decline in manufacturing employment and plant closures in many Technopolis sites. The Japanese case illustrates the problem of disregarding regional differences and their assets, developing local industries through either attracting industries from "outside" or by relocating industrial resources from other regions. Similarly, the Korean government introduced industrial relocation policy measures (subsidies, command & control) in the early 1980s to move firms and industries from Seoul to the rest of Kyonggi province, resulting in a relatively short distance de-concentration (30 to 40 kilometres). This was a reaction to the unfavourable consequences of the extreme primacy of Seoul in mid-1970s. The results were mixed: today, while Seoul still dominates, Seoul and Kyonggi province altogether became a bigger agglomeration of "the Capital Region", limited impacts on developing non-capital lagging regions have

been witnessed (Box 3.5). Today, policies of this kind in both countries have been replaced by policies with a more endogenous focus.

Box 3.4. **Japanese experience with industrial relocation, 1980s**

In the 1980s, the Japanese government introduced the Technopolis Programme that aims to relocate high-tech industries away from major metropolitan areas. However, the impact on regional development is ambiguous. Moreover, manufacturing, off-shoring and de-industrialisation in the 1990s hit the Technopolis sites particularly hard, resulting in a re-orientation of policy thinking towards regions as innovations systems based on the different regional conditions and assets.

Over the course of the 1980s, the focus of industrial policy in Japan moved away from heavy industry toward high-tech industries. During this period, the government introduced the Technopolis Programme which was an ambitious programme to relocate high-technology industries (particularly electronics and materials industries) away from the three major metropolitan areas (Tokyo, Osaka and Nagoya) and develop high quality research and educational facilities in the non-metropolitan areas. The aim was to develop "clustered" production complexes out of three major metropolitan areas that would develop self-propagating internal processes of innovation, technology development and transfer. The programme changed the direction from the traditional industrial relocation policies which focused on hard infrastructures to more comprehensive policies which include hard and soft infrastructures. The projects were programmed by sub-national governments, which had been very rare in Japanese industrial policies until then. From relatively small beginnings, the programme grew to encompass 26 sites around small or medium-sized cities. In order to influence the location of high-end innovation in the industry, the Brains-of-Industry Programme was established in 1988 as a complement to the Technopolis Programme, offering a range of incentives to industries which contribute to the sophistication of regional industries such as business service functions to relocate to Technopolis sites or to similar zones (OECD, 2004).

Economic changes over the course of the 1990s radically changed the context for regional industrial policy. In the 1990s, the pace of off-shoring and de-industrialisation accelerated in mature Japanese industries and many regions saw manufacturing employment decline and plant closures. The hollowing out of manufacturing seems to have affected the new industrial zones created through regional policies like Technopolis particularly hard. The Technopolis Programme aimed at endogenous business and regional development and tried to focus on soft infrastructures; but, in reality, regions focused their effort on the attraction of high-tech industries from outside their borders and much investment was on hard infrastructures. Designated Technopolises tended to have similar plans regardless of regional difference.

This background has led to a re-orientation of policy thinking towards regions as innovation systems, based on the different regional conditions and assets. In this approach, the key innovation assets include sector specialisations, skilled labour, research facilities, networks and advanced supply chains. These regional assets are seen in economic policy circles as key drivers in the revival of Japan's competitiveness. In 1998, the Technopolis Programme and the Brains-of-Industry Programme were abolished and integrated into the New Business Creation Promotion Law and its programme.

Source: OECD (2004), *OECD Territorial Reviews: Japan*, OECD Publications, Paris; Takeuchi, S. (2006), "Background and Trends of Technopolis Programme", *Journal of International Regional Studies*, No. 9, in Japanese.

Box 3.5. **Korean experience with industrial relocation**

The term industrial relocation, as far as it refers to policy measures (subsidies, command & control) to relocate low value-added industries out of advanced industrial regions and move them to less developed areas, in a somewhat explicit and concrete manner, could be used to describe some of the Korean policies until the 1980s. Korea's economic growth was initiated in the 1960s, and the story of its success can be characterised by several phases. In short, strategic promotion of light and labour-intensive manufacturing industries in the 1960s, heavy and petro-chemical industries in the 1970s and 1980s, service and IT industries in the 1990s. Entering the 2000s, Korea was seeking so-called "new growth engine" industries to sustain economic performance.

Industrial relocation in a strict form by which low value-added industries are relocated to less developed areas happened until the early 1980s. Let's note that Korea is a relatively small country, and the Capital Region (Seoul metropolitan area) has played a key role in the process of rapid economic growth. (Roughly speaking, Korea is half the size of Guangdong, that is, 100 000 square kilometres of territory and 49 million people.) By the late 1970s and early 1980s, Korea had experienced rapid simultaneous urbanisation and industrialisation leading to a high concentration of population and economic activities in the Seoul metropolitan area. The issue of regional disparities became one of the most important policy agendas, and the government tried to implement various policies to achieve decentralisation including industrial relocation.

In the mid-1970s, the Korean government sensed the unfavourable consequences of the extreme economic primacy of Seoul, and thus implemented strong measures such as the movement of manufacturing industries from Seoul to the nearby rural areas to slow down over-concentration in Seoul (Kwon, 1980). Seoul, with more than one-fifth of the total national population, was dominant over the rest of the nation and was a centre of innovation. Inter-regional inequality resulting from the excessive agglomeration in Seoul had become a growing concern for balanced regional development, and industrial relocation policy was implemented in such a context.

Yet, in the 1980s, the de-concentration was of a relative short distance. That is, firms and industries from Seoul were mostly relocated to the rest of the Kyonggi province, more likely closer than 30 to 40 kilometres. The relocated industries included light, labour-intensive and/or environmentally hazardous activities like textiles, furniture, non-metallic goods, chemicals, iron and steel. In order to implement such a relocation policy, the government had arranged institutional measures such as enactment of "the Distribution of Industry Act".

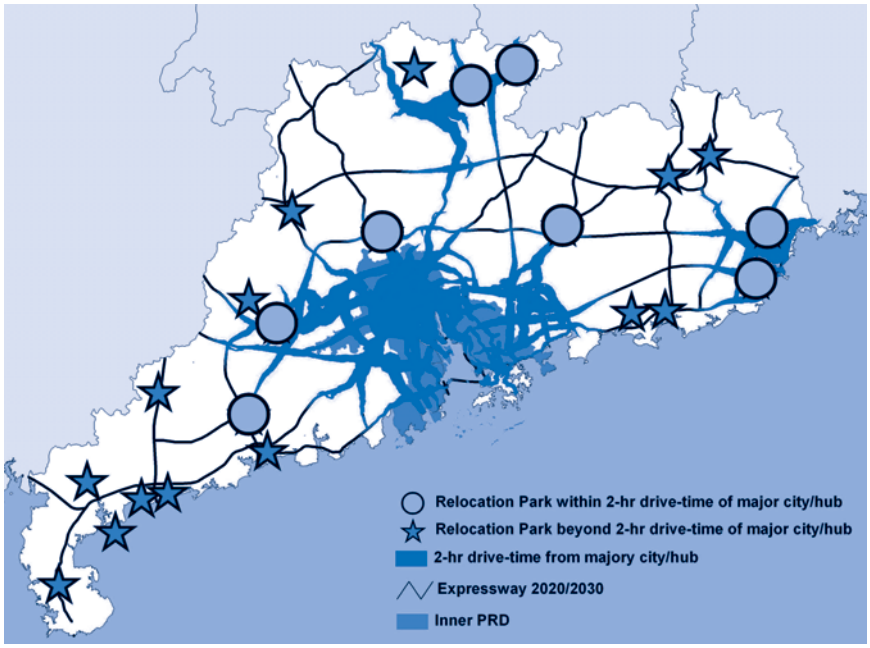
The decentralisation policy, rather than relocation, was a recurring policy focus of the Korean government from the late 1970s. As described earlier, the Korean government has since tried to mitigate the de-concentration in Seoul and to enhance balanced regional development. Yet, Seoul is still predominant over the rest of the nation, as Seoul and Kyonggi province altogether became a bigger agglomeration of "the Capital Region", which had 48.6% of national population on 11.8% of land as of 2005. Apart from the population, cultural and social resources, various job opportunities and high-quality services are also centralised in the capital region, so that it aggravates the concentration. Thus, the policy focus in the 2000s was on stronger deconcentration measures.

Access to input and output markets are of primary importance to firms when making location decisions, especially those in low valued-added sectors. This was the principal attraction of the PRD during the 1980s and 1990s: firms from Hong Kong, China had remarkably easy access to suppliers and port facilities. Given the low profit margins on the generally low value-added types of manufacturing by these firms, any cost saving is critical to ensuring their competitiveness in global supply chains. Today, low value-added manufacturers are more likely to relocate to other coastal locations in southern China – Beihai, Fengchenggang in Guangxi, Fujian, and the Yangtze River Delta – where there are more dense agglomerations of suppliers (including of labour), and where they have better access to export markets through coastal container ports, than in peripheral regions of Guangdong where these export-oriented advantages do not exist.

DRP was introduced in order to retain these firms in Guangdong, however relocation efforts have not yet achieved the impacts expected by Guangdong authorities. The premise behind the Guangdong authorities' DRP is that low and medium value-added manufacturers in the Inner PRD – which are now facing higher land and labour prices – would be willing to relocate to one of 28 relocation parks in Guangdong's periphery in exchange for much lower land and infrastructure costs. However, their markets are predominantly export markets. Only 8 relocation parks proposed by GDPG are within a 2-hour drive-time of any of the 8 strategic locations reviewed in this accessibility analysis (Figure 3.5). The other relocation parks are well beyond reasonable access to container ports in Guangzhou, Shenzhen, and Hong Kong, China, or to major rail-based distribution hubs in Shaoguan and Shantou. It is highly unlikely that lower land costs will compensate for the higher generalised transport costs that firms would face in other, more peripheral locations targeted under the DRP.

Similarly, labour tends to migrate to areas with the widest range of employment options, and where aggregated demand pushes wage rates higher. The PRD has already seen this happening during this decade when migrant workers began to shift to the YRD, causing a labour shortage that further undermined the PRD's competitiveness. While the DRP is focused on engaging local residents in the receiving locations to take up the expected new non-farming employment, there is, as reviewed earlier, a huge divergence in skills and knowledge between the PRD core and Guangdong's periphery. All relocation parks in the periphery are located in regions that have limited pools of working-age residents, and where educational and skills attainment are low. Firms are more likely to be attracted to locations where there is at least a semi-skilled labour force than to rely on supply driven by government efforts in training local workers from a relatively low base.

Figure 3.5. **Location of "Double Relocation" parks relative to two-hour drive times from strategic cities, 2020/2030**



Source: Author's GIS-based calculation; Li & Fung Research Centre (2008), "China's Industry Relocation and Upgrading Trends: Implications for Sourcing Business", in *China Distribution & Trading*, No. 56, December, pp. 1-16.

Upgrading the industrial base

Since the mid- and late 1990s, Guangdong provincial and local authorities have been concerned about upgrading the industrial base of the province in general and of the Pearl River Delta in particular. Processing trade, once recognised as the main driver for the PRD's industrial development, was perceived to not be viable in the long run. On the other hand, emerging trends of this decade concern the two main driving forces of Guangdong's productivity growth: the increased share of higher value activity in the ICT sector, and the growing percentage of higher value-added heavy industries (see Chapter 2). This transition has been propelled by both local and provincial governments' policies towards industrial upgrade:

- At the **local level**, Guangzhou has attracted heavy industry investment from Japanese automobile manufacturers – Honda, Toyota and Nissan since the late 1990s; Dongguan, the city that boomed thanks to processing trade industries, established its innovation development zone in 2001, named Songshan Lake Park, aiming to attract high-tech and innovation-oriented companies.
- At the **provincial level**, of particular importance are the long-lasting policies to focus development of selected pillar industries. For instance, the "Guangdong Development Plan for Nine Pillar Industries 2005-2010" recalled provincial pillar industries during the past decades, and stretched the future prospect of the provincial industries through stressing 9 pillar industries (Table 3.7). The

targets are to increase the percentage of three new pillar industries and three potential industries, while to reduce the percentage of three traditional industries. Guangdong's policies to support pillar industries tend to use investment attraction (e.g. firm subsidies) and investment in hard infrastructure, allocating the majority of resources to targeted pillar industries, in order to accelerate the speed of industrial upgrade (Bauhinia Foundation Research Centre, 2008). The percentage of 3 new pillar industries, 3 traditional industries and 3 potential industries to total provincial industrial output in 2008 was 42.5%, 12.8% and 7%, compared to 31.9%, 15.6%, and 5.2% in 2000 respectively. In particular, auto manufacturing has witnessed particularly strong growth during the period, accounting for 4% in 2008, up from 1.8% in 2000.

Table 3.7. **Evolution of Guangdong's pillar industries**

1980s
Light industries, such as food and beverages, textiles and garments
Early 1990s
Household electronic appliances, building material
Mid and late 1990s – early 2000s
Electronics and real estate development
Early 2000s-2008 ("Nine pillar industries")
Three new pillar industries: electronics and IT, machinery and household electric appliances, petrochemicals
Three traditional industries: textiles and garments, food and beverages, building materials
Three potential industries: paper manufacturing, pharmaceuticals, and auto manufacturing
2008- 2010 *(target in "*Modern Industrial System*")*
Modern service sector: financial services, logistics, information services, technology services, outsourcing services, business and exhibition industry, the cultural and creative industries and the headquarters economy
High-tech industries: electronic information, biological medicine, new materials, environmental protection, energy efficiency and new energy, marine life
Advanced manufacturing: equipment manufacturing, automotive, steel, petrochemical, and shipbuilding

Source: GDPG (2005), "Guangdong Development Plan for Nine Pillar Industries 2005-2010", *www.gd.gov.cn/govpub/fzgh/zdzx/0200611150010.htm*, in Chinese; GDPG (2008), "Decisions on Accelerating the Establishment of a Modern Industrial System", *www.gd.gov.cn/gdgk/gdyw/200807/t20080728_60362.htm*, in Chinese.

In line with the idea of choosing pillar industries, in 2008 the Guangdong provincial government introduced a new set of industrial upgrade policies to prioritise high value-added service sectors. The practice has followed Chinese central government guidance to develop service sectors in the National 11th Five-Year Plan. The "Establishing Modern Industrial System" Programme mainly targets the development of pillar industries, primarily in heavy manufacturing (e.g. automobile, shipbuilding, petro-chemical). It also highlights Guangdong's need to promote its leadership in developing modern service sectors centred on producer services (e.g. finance, logistics, business services), and high-tech industries led by ICT sectors (Table 3.7) (GDPG, 2008a). The idea of "Establishing Modern Industrial System" has also been codified in the "Outline for PRD", both of which stressed development targets for Guangdong and the PRD in particular (Table 3.8). To be highlighted is the stress on the service sector, which has been envisioned to become the mainstream of the provincial economy and modern service is the key.

Table 3.8. **Key "Modern Industrial System" quantitative targets for Guangdong and PRD by 2012 and 2020**

	For Guangdong as a whole	For PRD in particular
By 2012	Service sector should account for 50% provincial GDP	Service sector should account for 53% PRD GDP
By 2020	Modern service sector should account for 60% service sector	Service sector should account for 60% PRD GDP
		Modern service sector should account for 60% service sector
		Advanced manufacturing should account for 50% total industrial value added
		High-tech industries should account for 30% total industrial value added

Source: Guangdong Provincial Government (2008), "Decisions on Accelerating the Establishment of a Modern Industrial System", *www.gd.gov.cn/gdgk/gdyw/200807/t20080728_60362.htm*, in Chinese; National Development and Reform Commission (NDRC) (2008), "Outline of the Plan for the Reform and Development of the Pearl River Delta 2008-2020", National Development and Reform Commission, China, *http://en.ndrc.gov.cn/policyrelease/P020090120342179907030.doc*.

Major supporting instruments still concern investment in hard infrastructure (transport and energy supply) and investment attraction policies. The breakdown of spending from the stimulus package (named as "New Ten Projects"[17]) launched in 2008 for the period 2008-2012 is as follows: out of CNY 2.27 trillion (USD 325 billion) 28% will go to the transport network (PRD inter-city transit, subway, expressway, Hong Kong-Macao-Zhuhai bridge), 24% to energy security (thermal and nuclear power plants) and 21% to heavy manufacturing industries (shipbuilding, petro-chemical, steel, automobile). Only 8% of the package has been allocated to advanced services (e.g. Guangzhou Financial Innovation Service Zone) and high-tech industries (e.g. LCD TV display module) (Table 3.9). Building on the successful experiences of attracting industrial relocation from Hong Kong, China, Chinese Taipei and international investors, Guangdong authorities believe that high value-added service and manufacturing sectors could be attracted similarly. For instance, the **Guangzhou Financial Innovation Service Zone** located in Guangzhou Development District (GDD) sets the following targets for investment attraction over 2008-2012:

- to attract more than 5 regional headquarters of financial institutions (e.g. commercial banks, securities companies, insurance companies); more than 10 branches of financial institutions;
- to attract more than 20 financial institutions performing back office services;
- to attract or cultivate more than 5 venture capital firms and guarantee firms;
- to attract more than 8 manufacturers producing financial electronic equipment.

It is hoped that these financial institutions will be attracted to locate in Guangzhou thanks to preferential policies and supporting facilities (Box 3.6).

Box 3.6. **Guangzhou Financial Innovation Service Zone**

The Guangzhou Financial Innovation Service Zone (2.5 square kilometres) is located in the Guangzhou Development District, which is a major base for the development of advanced manufacturing and high-tech industry in Guangzhou. The zone aims to serve as the major carrier to strengthen Guangzhou's modern services sectors, in particular financial services. At present, there are dozens of financial institutions and well-known enterprises relevant to financial innovation services located in the zone, for example, Intel Data Security Solutions Centre, the intensive management centre of CCB, Guangzhou Iron and Steel Trading Centre, GRG Banking Equipment Co Ltd. and Guangzhou KingTeller Technology Co Ltd.

The Guangzhou Financial Innovation Service Zone consists of five sectors, including: the financial headquarters sector, the futures market sector, the financial service outsourcing sector, the financial back-office service sector, and the financial electronic equipment manufacturing sector. The financial headquarters sector is to be established in the headquarters economy zone in the science park and Yushu Park; the futures market sector is to be established in the convention and exhibition block of the science park and Guangzhou Iron and Steel Trading Centre; the financial service outsourcing sector is to be established in the comprehensive R&D incubation block of the science park, Guangdong Provincial Software Park, and Microsoft Base; the financial background service sector is to be established in the centre of the science park; and the financial electronic equipment manufacturing sector is to be established in the electronic information industry block of the science park.

Preferential policies and supporting facilities to potential investors are as follows:

Preferential policies: Financial institutions in Guangzhou Financial Innovation Service Zone may enjoy dual preferential policies granted by the Guangzhou municipal government and the Guangzhou Development District. The zone relies on the Guangzhou Science Park and the Luogang New Town under construction and enjoys a unique administrative system, as well as singular industrial, ecological, and cultural environments. Eligible financial projects may enjoy the support provided by the Guangzhou Development District, for example, special funds amounting to CNY 5-20 million for financial development, technical development, service outsourcing, and headquarters economy.

Supporting facilities: The science park is furnished with a comprehensive supporting 430 000 square metres service area, including such public facilities as schools, hospitals, gyms, and cultural and science and technology museums.

Source: Guangzhou Development District, "Investment Focus", No. 6. *http://eng.luogang.gov.cn/public/showArchive_/92\110\213_580.html.*

This new approach towards industrial upgrade does not mean that the numerous traditional industrial clusters, such as textiles in Foshan, that have been ingrained in the territory for many years, are doomed to disappear. On the contrary it means that it is necessary to concentrate efforts to align production with international standards and to strengthen the reliability and the diffusion of local brands. In this direction, for example, is the choice made in 2006 by the provincial government to choose Dalang (Dongguan, wool textiles), Chenghai (Shantou, toys) and Fenxi (Chaozhou, ceramics) as pilot towns for the creation of brands at the local level. In particular, Dalang township has announced a three-year programme for the registration and promotion of the brands "Dalang" and "Dalang Wool Textiles" at the international level. To this aim the local government provided initial funding of about CNY 1 million (approximately USD 146 315) in order to cover the initial costs, such as hiring experts, designing the

brand and planning the overall marketing strategy.[18] The government intervention to support branding is particularly important if we consider that the costs linked to an international brand are not sustainable for a single firm in China (especially for the smallest ones). On the contrary, the creation of local or town brands allows the firms in the cluster to jointly benefit from a common marketing strategy, undoubtedly reaching external economies that would have otherwise been impossible to obtain by the single actors (Barbieri, Di Tommaso and Rubini, 2009a and 2009b).

Table 3.9. **Spending on "Establishing Modern Industrial System" in Guangdong's "New Ten Projects"**

Spending category	Number of projects included	Main components	Total investment 2008-2012 (billion CNY)	% of total "New Ten Projects"
Transport network	71	PRD inter-city rail transit, fast railway between Guangzhou and Wuhan, subway in Guangzhou, expressway between Guangzhou and Shaoguan, Hong Kong-Zhuhai-Macao bridge, Chaoshan civil airport, etc.	647.2	28.4%
Energy security	28	Thermal powers in Shantou and Huizhou; nuclear power in Shenzhen, Yangjiang, Taishan, and Shanwei; etc.	553.4	24.3%
Advanced manufacturing	16	Shipbuilding, Guangzhou automobile industry, refinery and petro-chemical in Shenzhen, Maoming, and Zhanjiang, steel making in Zhanjiang, paper making in Jiangmen, etc.	481.4	21.1%
Modern services	31	Guangzhou Financial Innovation Service Zone, Shenzhen International Financial Centre, Guang-Fo Financial Outsource Centre, Guangzhou Business and Trade Cluster, Hengqin Business Exhibition Centre, etc.	110.4	4.8%
High-tech industry	19	National and provincial key laboratories, Spallation Neutron Source Project, LCD TV display module projects, etc.	70.5	3.1%
Sub-total			**1 862.9**	**81.8%**
Others		Agriculture and water (e.g. coastal flood proof infrastructure); livable environment (e.g. providing affordable rental housing in urban areas); social development (e.g. establishing schools and library); resource reserves (e.g. national crude oil reserve); industrial relocation	414.1	18.2%
Total "New Ten Projects"			2 277	100%

Source: GDRC, *www.gddpc.gov.cn/zwgk/zdxm/xsxgc/200807/t20080715_24435.htm, in Chinese.*

In fact, the industrial upgrade process highlights the intention of the Guangdong provincial government to shift from a hard and tangible focus to a soft and intangible one. In many cases, Guangdong enterprises demonstrate strong capacities in facing the problems linked to the concrete production process. What seem to be lacking are their capacities to evaluate the production chain as a whole and to take into proper consideration the importance of investing in "intangible" aspects such as research,

design, innovation, branding, marketing and so on. Therefore, a particular focus is put on the need to increase and valorise the intangible content of local industrial productions by means of industrial cluster promotion. For instance, the provincial policy document *Thoughts and Strategies for the Development of Clusters in Guangdong and for Brands Creation* (2005) proposes:

- to foster not only the development of specialised towns *per se*, but also the collaboration among specialised towns, in order to limit territorial overlapping and intra-provincial competition;
- to create *ad hoc* supporting centres specialised in quality control;
- to favour the creation of brands at the local level so as to increase the capacity of firms and specialised towns to compete effectively in the international market;
- to increase the diffusion of knowledge on the rules for patenting and for the protection of intellectual rights.

The fundamental driver of industrial upgrade concerns improving innovation capacity, which has been manifested in several policy documents of Chinese central and Guangdong provincial governments. These include the "Outline of Guangdong's Indigenous Innovation Plan" and the "Outline for PRD". Specific quantitative targets have been set for 2008-2020 (Table 3.10). Concrete policy areas have been illustrated, for instance, in the "Outline for PRD" in five areas:

- The PRD has to boost its innovative capacity in critical high-tech areas, such as electronics, biology and new medicine, new materials, energy conservation, etc. R&D spending is believed to be increased and guided to these areas.
- These policy interventions have to be directed at improving the capacity of firms to carry out innovation activities, through supporting measures such as tax reduction and public procurement.
- Knowledge exchange and spillover will be spurred by establishing an "open regional innovation system".
- Linkages between industries and university/research centres need to be enhanced, through establishing more collaborative alliances.
- Furthermore, local policy makers clearly stated their intention to "actively develop intellectual property protection, lease financing, and venture capital" in the "Outline for PRD".

Table 3.10. **Key innovation targets for Guangdong and PRD, by 2012 and 2020**

Innovation targets by 2012		Innovation targets by 2020
For Guangdong as a whole	For PRD in particular	For PRD in particular
Ratio of gross expenditure on R&D in Guangdong should reach 2%	Spending on R&D as a percentage of GDP: 2.5%	Transform from "Guangdong manufacturing" to "Guangdong creating"
The number of patent application: 300 per million people in Guangdong	The number of patent application: 600 per million people in PRD	The number of top national universities with international recognition: 1-2
S&T should contribute 55% to economic development in Guangdong		Form a well shaped regional innovation system with international openness
The number of total R&D personnel: 300 000	The number of total R&D personnel: 280 000	
The degree of reliance on foreign technology should drop to 50%	The number of key national laboratories, engineering centres and engineering laboratories: 100	Establish a well functioning indigenous innovation environment with complete elements, strong support, and an open and tolerant nature
Industrial output of high-tech sector should reach 3.8 trillion yuan		
High-tech enterprises with annual sales above CNY 10 billion (USD 1.4 billion) should reach 50	Promote 50 national level and 10 international level enterprises with strong innovation capacity	
The number of long-term collaboration alliances between universities, enterprises and research institutes should reach 100		The number of collaborative alliances between enterprises, universities and research institutes: around 100

Source: GDPG (2008), "Outline of Guangdong's Indigenous Innovation Plan", Guangdong Provincial Government, *www.gdstc.gov.cn/msg/image/tzgg/20090206jhc04.doc*; NDRC (2008), "Outline of the Plan for the Reform and Development of the Pearl River Delta 2008-2020", National Development and Reform Commission, China, *en.ndrc.gov.cn/policyrelease/P020090120342179907030.doc*.

A key emerging concept concerns the "open regional innovation system" that shall aim to promote knowledge spillover. The "Outline for PRD" translates the concept into specific actions, including:

i. to encourage technology collaboration with Hong Kong, China and Macao, China, e.g. to support the joint undertaking of S&T breakthrough programmes;

ii. to plan the Shenzhen and Hong Kong, China Innovation Zone (Box 3.7), and to support the formation of collaboration alliance between universities, enterprises and research institutes in Guangzhou and Hong Kong, China;

iii. to support pilot innovative development model experiment in national development zones in Guangzhou;

iv. to encourage enterprises to co-operate internationally in innovation, e.g. attract relocation of MNC's R&D centres;

v. to improve the operation of innovation platforms, e.g. establish mechanisms for sharing of technological equipment and information;

vi. to establish a few key innovation platforms, e.g. Shenzhen National High-Tech Innovation Centre, South China New Medicine Innovation Centre, Guangzhou Biology Island.

The above actions clearly demonstrate Guangdong's intention to make use of external resources, for instance from Hong Kong, China and foreign companies, through co-research, attracting R&D centres and establishing technology innovation platforms (Box 3.7) to absorb and diffuse knowledge. However, as demonstrated in Chapter 2, Guangdong's innovation has developed without strong public research organisations and universities. Weak public research infrastructure could potentially constrain innovation spillover, since it acts as crucial intermediate inputs and has the capacity to absorb, generate and share knowledge.

Box 3.7. **Shenzhen and Hong Kong Innovation Circle**

The "Shenzhen-Hong Kong Innovation Circle" is a co-operation agreement signed in 2007 by the Shenzhen municipal government and the Hong Kong, China SAR government, aiming at comprehensive promotion and enhancement of technology collaboration between the two cities. The name "circle" indicates the place focus on the border area of Shenzhen and Hong Kong, China, covering the area of education and R&D clusters in the north of Hong Kong, China, as well as the manufacturing cluster in the south of Shenzhen.

Seventeen areas of collaboration have been specified in the co-operation agreement by the two governments. Of primary importance are identifying a governance structure for co-operation, formulating strategies and implementation plans together, enhancing exchanges of knowledge, facilities and personnel, and encouraging technology-oriented research and projects.

The governance structure is centred on the Steering Group of Shenzhen-Hong Kong, China Co-operation in Innovation and Technology, which meets twice per year for the purpose of senior-level official negotiations and communications on the organisation and supervision of the arrangements for co-operation between the relevant bodies from Shenzhen and Hong Kong, China. The Steering Group is co-chaired by the Secretary of the Commerce, Industry and Technology Bureau (now Commerce and Economic Development Bureau) of Hong Kong, China and the Deputy Mayor of the Shenzhen municipal government.

A three-year implementation plan (2009-2011) is currently underway, comprised of 24 co-operation projects under 3 categories: Innovation Foundation (e.g. provision of laboratories or facilities), Service Platform (e.g. sharing of technological resources and provision of technological services platform) and Major R&D Projects (e.g. co-operation in particular technological areas, such as solar batteries). Approved projects will receive incentives in terms of funding support from both the Shenzhen municipal government and the Hong Kong, China SAR government. For instance, Dupont Apollo set up its Thin Film Photovoltaic Business and R&D Centre in Hong Kong, China in 2008, while launching its manufacturing facility in Shenzhen in 2009. The joint effort of DuPont Apollo and the two governments is geared toward establishing a strong Solar Energy Research and Industrial Platform in the region, with Hong Kong, China as the R&D hub and Shenzhen as the manufacturing base, forming a full value chain for the photovoltaic industry.

Source: Hong Kong, China SAR Government (2007), "Agreement on Shenzhen/Hong Kong Innovation Circle", press release, *www.info.gov.hk/gia/general/200705/21/P200705210224.htm*; "Shenzhen/Hong Kong Innovation Circle" Co-operation Agreement, *http://gia.info.gov.hk/general/200705/21/P200705210226_0226_27784.doc*; "Three Year Action Plan of Shenzhen/Hong Kong Innovation Circle", *http://gia.info.gov.hk/general/200903/31/P200903300270_0270_51031.doc*; Dupont Apollo, "Corporate Info", *www2.dupont.com/Apollo/en_HK/innovation/innovation_circle.htm, accessed on 15 October, 2009*.

3.3. Assessment of current policy tools: towards a regional development policy for Guangdong

The current policy packages tackling industrial upgrade and regional disparities represent an ambitious plan, promoting principles of both "excellence" and "harmony". The challenge for Guangdong is to manage rapid industrialisation and urbanisation through active regional intervention, but without repeating the mistakes made by some OECD member countries when they attempted to artificially redefine economic geography through major public investments. Experiences in OECD member countries show that there are some limits to the types of policy tools that are currently used to implement the strategy, e.g. adopting a sectoral approach, focusing on selecting pillar industries, investing in hard infrastructure and using subsidies to firms to attract investment. More specifically:

- Despite massive government-led investments, challenges lie in how to improve attractiveness to high value-added activities. Experiences in OECD member countries show that the strength of human capital (skills and education of local workforces) is one major driver of a region's competitiveness (OECD, 2009d). Although Guangdong has an abundant supply of qualified human capital to work in labour-intensive industries, the province lacks sufficient advanced human capital to engage in higher value-added industries. In the same vein, whilst Guangdong has considerably increased R&D intensity by incrementally increasing investment, the cumulative R&D spending on a per capita basis remains lower than some other Chinese regions, e.g. behind Beijing, Shanghai, Tianjin, Jiangsu and Liaoning.
- DRP is a comprehensive governmental policy to foster a more balanced regional development approach in the province. Experiences in OECD member countries with similar regional policies might provide interesting insights into the effectiveness of this approach: directive relocations of economic activities produce only marginal results. In particular, the development of subsidised industrial parks in remote regions has proved to be extremely costly and largely ineffective in some OECD member countries (e.g. Technopolis Programme in Japan in the 1980s-1990s). Low value-added manufacturers in Guangdong are more likely to relocate to other coastal locations rather than DRP parks. Similarly, labour tends to migrate to areas with the widest range of employment options, and where aggregated demand pushes wage rates higher.

The current policy framework for the implementation of the Guangdong strategy could be inspired by some elements of the "OECD's New Paradigm of Regional Development Policy", which aims to foster regional competitiveness whilst dealing with persistent inefficiency and social exclusion in specific places. Regional policies in OECD member countries were originally deeply rooted in alleviating economic disparities through a top-down, sectoral approach with a heavy focus on redistributive subsidies. The new regional paradigm is oriented towards integrated and well-targeted investment in activities with a local competitive advantage. Policy tools have evolved from short-term subsidies into a much broader family of long-term development policies designed to enhance regional competitiveness, including a greater focus on endogenous assets rather than exogenous investment and transfers (Box 3.8 and Table 3.11). The new paradigm in regional policy – with an emphasis on market

mechanisms, endogenous growth and on collaboration across levels of government – is clearly relevant for Guangdong.

Box 3.8. The OECD's new paradigm of regional development policy

Regional policy began in most OECD member countries in the 1950s and 1960s, a period of relatively strong economic growth, fiscal expansion and low unemployment. The principal objectives of the measures introduced were greater equity and balanced growth in a period of rapid industrialisation. The main instruments used were wealth redistribution through financial transfers by the national government, accompanied by large-scale public investments. During the 1970s and early 1980s, successive economic shocks and changes in the global economy led to the emergence of geographical concentrations of unemployment in many countries and regional policy evolved rapidly to address this new challenge. The earlier focus on reducing disparities (in income, in infrastructure stock, etc.), was widened to include employment creation. The assumption was that public policy could alter supply conditions (essentially by changing production cost factors through production subsidies and incentives) and thereby influence industrial (re)location decisions for both existing firms and new investments. Overall, the results were disappointing. Regional disparities were not significantly reduced, appearing as entrenched as ever in many countries despite significant public investment. At a regional level, there was only limited success in restructuring the economic base of the target areas.

In response to these poor results, OECD member countries have over the past few years promoted a new paradigm of regional policy that aims at helping each region, whether wealthy or not, to maximise its own comparative advantages in a positive sum game that contributes to national objectives. Regional policy has therefore been evolving from short-term subsidies into a much broader family of long-term development policies designed to enhance regional competitiveness. These can be characterised as follows:

- a development strategy covering a wide range of direct and indirect factors affecting the performance of local firms;
- a greater focus on endogenous assets rather than exogenous investments and transfers;
- an emphasis on opportunity rather than disadvantage;
- a collective/negotiated approach to governance involving national, regional and local government along with other stakeholders, with the central government taking a less dominant role.

The rationale of the new regional approach is based on the principle that growth opportunities exist in the entire territory, across all types of regions, as documented in the OECD report Regions Matter: Economic Recovery, Innovation and Sustainable Growth (2009). The aim is to maximise national output by assisting and encouraging each individual region to reach their growth potential endogenously, thereby departing from the old view of regional polices as a zero sum game. Evidence of this "paradigm shift" in regional policy can be seen in recent reforms of regional policy in some OECD member countries.

Source: OECD (2009), *Regions Matter: Economic Recovery, Innovation and Sustainable Growth*, OECD Publishing, Paris.

Table 3.11. **Old and new paradigms of regional policy**

	Old paradigm	New paradigm
Objectives	Compensating temporarily for location disadvantages of lagging regions	Tapping underutilised potential in all regions for enhancing regional competitiveness
Unit of intervention	Administrative units	Functional economic areas
Strategies	Sectoral approach	Integrated development projects
Tools	Subsidies and state aid	Mix of soft and hard capital (capital stock, labour market, business environment, social capital and networks)
Actors	Central government	Different levels of government

Source: OECD (2009), *Regions Matter: Economic Recovery, Innovation and Sustainable Growth*, OECD Publishing, Paris.

Concrete application of the principles of the regional development paradigm for Guangdong could be as follows:

Capitalising on innovation and skills as the main drivers of regional growth and industrial upgrade

Guangdong needs to better develop its knowledge generation infrastructure, so as to improve innovation performance and attract higher quality FDI. To boost knowledge creation capacity in Guangdong, a target has been set to increase R&D intensity to 2.0% by 2012, up from the current level of 1.41% (2008), compared to the OECD average of 2.26% (2006). R&D composition indicates that gaps in R&D intensity originate from weak public R&D. Guangdong needs to strengthen public research organisations and universities in the innovation system. This can be achieved by establishing more regional universities, as well as increasing the capacity and quality of existing universities – or even specialised research centres.

A key to better knowledge generation capacity is high quality human capital, which could be attracted to Guangdong and benefiting the province through enhanced partnerships with Hong Kong, China. Nearby Hong Kong, China did not recognise the importance of developing a regional innovation strategy until recently. In 2005, Hong Kong, China's R&D intensity (0.81%) was only a third the rate of Singapore (2.4%) (Hong Kong Census and Statistics; Singapore Statistics). Hong Kong, China is also relatively undeveloped in comparison with Singapore, Japan and Korea, as measured by patent applications per million inhabitants according to the World Intellectual Property Organisation (WIPO). When compared with Singapore, the only technology field in which Hong Kong, China has a higher patenting rate is furniture and games, sectors of relatively low value added (*WIPO Statistics database*, 2008). However, Hong Kong, China has unique advantages that Guangdong does not have in attracting high quality researchers, including a pool of highly qualified scientists and top-ranked universities (fourth in Asia). The large number of highly skilled Chinese expatriates in OECD member countries also demonstrate the great potential, in particular those of Cantonese and Hong Kong, China origins (Dumont and Lemaître, 2005; Tan, 2010). As Hong Kong, China attracts highly skilled human capital, more benefits could be achieved for Guangdong through partnering with Hong Kong, China. The current "Hong Kong-Shenzhen Innovation Circle" is a notable collaboration initiative that is expected to provide the platform for talent attraction. Copenhagen in Denmark and Malmö in Sweden have taken a range of policy measures to foster a joint innovation strategy, in particular, through co-operation programmes

among higher education institutions with the establishment of the Öresund University (Box 3.9).

Box 3.9. **Policies to promote labour market integration in the Öresund cross-border region**

Öresund is a cross-border region comprising the Danish island of Zealand, including Copenhagen the capital city, and the Skåne region of Sweden, with Malmö, Sweden's second largest city. Since 2000, the 2 cities have been linked by a rail and road bridge. This new transport infrastructure has resulted in a single functional region spanning two different countries. The Öresund region has developed significant strength in knowledge-intensive activities including the medical and pharmaceutical industries and certain segments of information and communication technology industries. It is also strong in food processing, and has developed an environmental cluster with companies that either produce environmental technologies or make production of products and services more environmentally friendly.

The education sector has been at the forefront of promoting co-operation among knowledge generators and users. With a total of 20 universities and 130 000 students, the Öresund Region has many strengths in the education and research sectors. More important than the existence of these resources, however, is the co-operation between universities that has developed over time. Long-term informal co-operation was formalised in 1997 with the creation of the Öresund University. This institution has been a leading actor not only around formal scientific research and education, but also around the creation of institutions to promote more informal networking activity and information sharing for economic activities. Working in collaboration with researchers, business leaders and policy makers throughout the region, the university has helped in identifying critical growth-driving clusters and facilitating the development of networking associations in these areas. The organisations – Medicon Valley Academy, Öresund IT Academy, Öresund Food Network, and Öresund Environment – play an important role in promoting networking and integration across the region, and show a great deal of promise for the future.

Source: OECD (2003), *OECD Territorial Reviews: Öresund, Denmark/Sweden*, OECD Publishing, Paris.

Public authorities in Guangdong can play a catalysing role in promoting knowledge spillover by partnering with regional actors, including research organisations, universities, large and small firms. All these players will be needed to improve the productivity of the regional innovation system. Currently, one of the main public instruments to foster innovation spillover is the knowledge centre that is part of the Specialised Town Programme. Knowledge centres act as platforms to promote spillovers and exchanges with other firms. However, the evaluation so far has highlighted difficulties in increasing co-ordination between universities and in promoting the idea of risk sharing among firms. Helsinki offers an interesting example of a well functioning regional innovation policy embodied in a collaborative effort between public authorities, universities, polytechnics, science parks and the business community (Box 3.10).

Box 3.10. **A well-functioning triple helix model: Helsinki Culminatum Ltd.**

For almost 20 years, the City of Helsinki and the University of Helsinki have persistently built up their co-operation, the most important ingredients of which are: promoting science-driven business enterprises with the aid of a common business incubator and science park, co-operating in urban planning and traffic planning to develop transport and logistics between campuses, creating a common Student City concept to increase international attractiveness, promoting urban research by creating initially 6 (today 9) professorships in urban research, and collaborating with the city's own think-tank Helsinki City Urban Facts.

Besides their international co-operation, the University of Helsinki and the city of Helsinki have been initiators in establishing the Helsinki Region Centre of Expertise Culminatum Ltd. This public-private organisation is based on the triple helix model, which means that one-third of its shares are owned by the local universities and research institutes, one-third by the city of Helsinki, its neighbouring municipalities and the Uusimaa Regional Council, and one-third by the business community, financers and science park companies.

Helsinki Culminatum forms a co-operation forum and a basis for the development of common projects. It focuses on two main missions, namely:

- Managing regional cluster-building activities in six selected sectors of the knowledge-based economy. Development programmes and actions are funded mainly by the cities and by national innovation organisations. In sharing their knowledge, universities and polytechnics play a crucial catalysing role in development projects. One of the focus areas of Culminatum is to help university spin-off companies grow. Cluster-building activities by Culminatum combined with the funding from the National Technology Agency (Tekes) have contributed to increased interaction between SMEs and higher educational institutions.

- Developing the Helsinki Region as a world-class innovation ecosystem – as an Ideopolis. Early 2005 saw the birth of Yhdessä Huipulle (Together to the Summit), a common innovation strategy by Culminatum's owners presenting 26 common development projects of the universities, cities and the business community on 4 key issues: *i)* increase the international appeal of local research and education; *ii)* develop strong clusters and create test beds and living labs for product service development; *iii)* apply innovations to renew the welfare services provided by the cities and to consolidate the role of the cities in R&D; and *iv)* support university-driven business growth by, for example, developing a second generation science park concept.

Source: OECD (2006), *OECD Territorial Reviews: Stockholm, Sweden*, OECD Publishing, Paris.

Guangdong's inventive activity is highly concentrated in a few firms, which calls for a shift from closed to open innovation. Guangdong's concentration of innovation activity, in particular regarding Huawei, is similar to that in a number of OECD regions, for example Phillips in the Netherlands and Nokia in Finland. But there are strategies to cultivate spillovers from these anchor firms. Philips Research in Eindhoven founded MiPlaza (Microsystems Plaza) in 2004 as part of the firm's business strategy to be a facility that offers expertise, service and infrastructure for high-tech research by other firms, located in a high-tech campus with other public research facilities. Although these strategies appear to be market driven initiatives from the private sector, a functioning open innovation environment requires co-efforts from the government and the public research organisations/universities. Government needs

to play an enabling role to support innovation, e.g. grants for start-up. Public research organisations/universities need to carry out knowledge absorption and generation, playing the role of the source of open innovation.

While SMEs could be the potential beneficiaries of innovation spillover, Guangdong needs to continue strengthening SMEs' absorptive capacity that could encourage a large number of firms to innovate. Guangdong's large number of sub-contracting SMEs has developed high productivity and technological capacities in specific manufacturing processes. However, they are reluctant to invest their limited profits in R&D. While current supporting programmes have clearly addressed linkages, e.g. establishing intermediate institutions that provide services and information networks in specialised towns, strategic investments may be required to improve innovative and absorptive capacities of SMEs. The investment could target SMEs' capacity to expand market-oriented horizontal and lateral linkages, carry out R&D activities, and develop new products, as demonstrated in the Japanese Industrial Cluster Programme (Box 3.11).

Focusing on the Outer PRD as a first step of the "Double Relocation" Policy

Drive-time analyses demonstrate emerging locational advantages of the Outer PRD, which could be developed as a first step of the provincial "Double Relocation" Policy (DRP). Although agglomeration benefits have been exploited in the Inner PRD region, the effects have not been realised in other sub-regions, in particular the Outer PRD. The drive-time analyses clearly demonstrate that parts of the Outer PRD are becoming more accessible to strategic logistical and distribution hubs in Guangdong and Hong Kong, China. Its land prices are significantly lower than in the Inner PRD. Furthermore, the analysis suggests that accessibility will only be improved in the non-PRD to a limited extent by 2020/2030. Rather than covering all non-Inner PRD regions, a first step of DRP could be adjusted to foster agglomeration economies in the Outer PRD. There are, however, major challenges in "opening up" the Outer PRD.

The first challenge is accessibility, which could be addressed through careful planning of additional expressway links and feeder roads. Compared to the Inner PRD, the Outer PRD is far less accessible, although this will improve by 2020 when planned expressways are to be completed. To further improvement, carefully planned additional investments in expressways in the Outer PRD are needed to improve two- and three-hour accessibility to strategic logistical and distribution hubs in Guangzhou (Nansha Port), Shenzhen, and Hong Kong, China, and to produce services in these metropolitan regions. Other than the Outer PRD, Guangdong's periphery will continue to have difficulty in attracting export-oriented firms until the Outer PRD has been fully developed. This requires efforts to plan in advance, e.g. invest in high-speed road links between peripheral municipalities and strategic distribution hubs in Shaoguan (rail) for the Northern Region, and Shantou (rail, bulk cargo port, container terminal) for the Eastern Region.

Box 3.11. **Japan's Industrial Cluster programme**

Japan has recognised SMEs' importance in innovation and technology policy. Policies to encourage existing SMEs to innovate are considered very relevant to regional specialisation and clustering. Prior to 1980 during Japan's rapid growth phase, many Japanese SMEs in the manufacturing sector were organised into hierarchical vertical supply-chains led by larger companies. Long-term relationships in these vertical chains enabled SMEs to develop excellent technological and process capabilities in specific niches. But a shift away from this system is underway – for example, SME subcontracting rates in the general machinery sector have declined from nearly 85% in 1981 to under 60% today.

The challenge now is to encourage and support these existing technologically advanced SMEs to develop market-oriented horizontal and lateral linkages, to increase investments in R&D (non-subcontracting SMEs are twice as likely to undertake R&D as subcontracting SMEs), and develop their capacity as product-developing SMEs.

To tackle those challenges, the Japanese Ministry of Economy, Trade and Industry (METI) introduced the Industrial Cluster Programme in 2001 which supports SMEs and research links in a range of regional area types through business incubation and support services with a strong focus on effective relationships among industry, university and government. It has changed the policy direction from top-down management toward bottom-up policy development based on regional initiatives.

The programme has selected 18 large regions to support clusters, and provides specific funding to support private cluster promoting organisations (e.g. JPY 16.6 billion in FY 2009). It has also recognised the evolution of policy supports for a long period (see table below).

Industrial Cluster Programme stages

Timeframe	Evolution of the programme
1st term (2001-2005) Start-up period of an industrial cluster	Based on the current state of and policy needs for clusters, about 20 projects were started as the Industrial Cluster projects mainly led by the central government to form the "network where each face is visible", a basis for industrial clusters, in co-operation with clusters which are developed independently by local governments.
2nd term (2006-2010) growth period of an industrial cluster	Networking promotion continues and specific businesses are developed. At the same time, management innovation of companies and the creation of ventures are promoted. If necessary, projects are revised and new projects are prepared flexibly.
3rd term (2011-2020) self-sustaining developing period of an industrial cluster	Networking and development of specific businesses are further promoted. Financial independence of industrial cluster activities is encouraged for the self-sustaining development of the clusters.

The clusters that are targeted are quite diverse. For example, whereas TAMA is focused around parts of a huge and industrially dense metropolitan region, the Hokkaido Super Cluster project (Bio and IT) has a networked character involving 29 universities and some public research institutes, and nearly 500 companies in 4 non-contiguous locations within the prefecture. In the Kinki region, which includes the cities of Osaka, Kyoto, and Nara, a Bio Cluster project has been established involving 56 universities, 9 local governments, 14 public research institutes, and about 350 companies spread over multiple locations. (METI, http://www.cluster.gr.jp/plan/index.html, accessed 29 April 2010). Interventions to clusters differ according to regions types.

Source: Japanese Ministry of Economy, Trade and Industry (METI) (2005), "Report on Industrial Cluster Programme", evaluation report submitted to METI by the Industrial Cluster Study Group.

The second challenge is ensuring sufficient supply of industrial land that would keep prices affordable to low and medium value-added firms relocating from the Inner PRD. The challenge of "emptying the nest for new birds" in the Inner PRD is one that land markets are already meeting: firms that cannot capitalise rising land costs into competitive selling prices of their outputs are either closing down or relocating to areas in China and elsewhere in Asia where capitalised land and generalised transport costs enable them to realise profits. To counter this trend, the Guangdong provincial government would need to make a key policy decision to adjust the province's quota for conversion of agricultural to construction land, granted by the central government's Ministry of Land and Natural Resources, in favour of municipalities in the Outer PRD.

The third challenge is for the municipalities in the Outer PRD to mobilise resources (including management capacities) needed to ensure adequate levels of infrastructure services in these new industrial developments. The Outer PRD has been poorly emphasised by Guangdong authorities in terms of industrial parks provided. Locational focus of central and provincial governments' industrial policy in Guangdong have concentrated over 40% of the land area of senior-level industrial parks in the Inner PRD, followed by the Western Region (25%), the Eastern Region (15.3%). The Outer PRD holds 9.6% of approved industrial land area, and the Northern Region holds 8.5%. However, on a per capita basis, the ranking of regions is quite different (Table 3.13). The Western Region has the highest stock per resident of central and provincial government-approved industrial land in the province, followed by the Inner PRD, the Northern Region, the Outer PRD, and the Eastern Region.

Table 3.12. **Regional share of central and provincial government-designated industrial parks, 2007**

	Population 2007 (est.)	% of Guangdong's population	Area of central and provincial industrial parks (hectares)	% of total central and provincial industrial parks	Square metres per resident
Inner PRD	34 087 455	36.1	39 432	41.3	11.6
Outer PRD	10 787 338	11.4	9 152	9.6	8.5
Eastern Region	23 043 843	24.4	14 602	15.3	6.3
Northern Region	8 966 638	9.5	8 126	8.5	9.1
Western Region	17 586 008	18.6	24 098	25.3	13.7
Guangdong	94 471 282		95 410		10.1

Source: Author's GIS-based calculation.

The fourth challenge is urban and environmental quality. The Inner PRD developed rapidly in a haphazard way that led to inefficient land use. Ensuring that the Outer PRD is not developed in the same way will require far more careful planning, monitoring, and development control by the Guangdong provincial government. In fact, low and medium value-added manufacturing does not inherently mean poor standards of industrial development. Guangdong provincial government has, in the Outer PRD, an enormous opportunity to develop this strategic region in an environmentally sustainable way while ensuring that manufacturing continues to drive employment and economic growth in the province. Measures to address the issue include: *i)* consider giving fiscal and management support to these municipalities in the Outer PRD to ensure that new industrial parks are developed to high environmental standards and levels of infrastructure services; and *ii)* significantly improve provincial planning, monitoring, development co-ordination and control practices in the Outer PRD to ensure that new industrial and urban development becomes Guangdong's and China's

global showcase of economically and environmentally sustainable industry into the 21st century.

Promoting endogenous growth in lagging regions

Promoting endogenous assets in peripheral lagging regions is essential for them to develop. This requires prerequisite levels of public service provision and strategic investments that could leverage existing comparative advantages.

A first step to promote endogenous growth is providing adequate, high-quality public services in lagging regions. Experience from OECD member countries has proven that promoting balanced development among regions is a complex goal. This requires different and complementary policy measures commonly aimed at making places more attractive for people and firms. One of the most relevant aspects concerns the provision of high quality collective public goods and services. This improves living conditions and increases the region's attractiveness both to people and to firms considering relocation. The most important public goods and services include: network infrastructure for high quality accessibility; local public transport; high level education and training for local workers; housing for workers and people; health care and social services; public utilities services and other services to individuals and firms; and environmental and landscape preservation. Collective public services may offer opportunities to develop "new industries" in lagging areas. Some of the items have been covered in Guangdong's DRP, yet could be further strengthened. For instance, out of the CNY 22.5 billion that will be allocated by the provincial government over 2008-2012, CNY 5 billion will go to a training programme for migrant workers, e.g. 22% of the total provincial allocation against 67% for the construction of new parks and 11% for subsidies to firms.

More attention could be paid to increase the availability and quality of collective services in the lagging inner regions and rural areas of Guangdong. In many OECD member countries, such policies include creating the structural conditions that enable adequate provision of public goods and services. The case of the Italian Regional Policy is particularly significant in this regard. An incentive mechanism has been implemented to increase the commitment of local authorities to fulfilling the above-mentioned goals in the territories where they were most needed, such as the southern regions (Box 3.12). The Italian experience considers development in a multi-dimensional perspective, and raises awareness around critical objectives through a collaborative engagement between different levels of government. Moreover, the incentive tool requires an *ex ante* evaluation of territorial weakness, in order to understand which public services should deserve more attention and be improved. Another key item in the incentive mechanism concerns the selection of indicators and targets. In particular, the fields of intervention should be relevant for public action; indicators and targets should be easily measurable, and the chain of responsibilities to attain the objectives clearly identified. Strong co-operation between the different spheres of government involved in the delivery of the selected service is also relevant. Finally, regular monitoring of the progress of policy interventions is fundamental for the implementation of the mechanism.

Box 3.12. **Public service provision in lagging areas in Italy**

Italy is a high-income country with strong territorial disparities in regional economic performance and in the availability of essential services to citizens and firms, with southern regions lagging behind. This justifies the development of regional policies to structurally reduce these disparities. As in many other OECD member countries, Italy's regional policies focus on re-addressing structural imbalances among territories and strengthening their competitiveness. It does so by focusing on regions' specific comparative advantages and intervening locally through targeted public investments. These efforts have undergone a profound transformation since the 1990s. In particular, two trends have reshaped Italian regional policies: i) decentralisation has led to enhanced co-operation between regional and national authorities, as well as with other local stakeholders; ii) policy effectiveness has been improved by the adoption of a results-oriented approach to planning and expenditure, the use of conditionality for funds allocation, as well as greater attention to the evaluation and monitoring of policy interventions. While the design and implementation of regional policy have required strong co-ordination among multiple levels of government, the tasks of each different level of government involved have also been clearly defined. Implementation efforts are guided by the principle that lower levels of government, namely the intermediate level represented by the regions and local governments, are in the best position to select and implement development projects. The central government continues to play a strategic role in setting key priorities and general rules for policy implementation, allocating funds to regions (European and national conditional grants), monitoring implementation and providing technical assistance to enhance institutional capacity of regions and local governments.

By focusing on the provision of public goods and services in areas of greatest need, Italian regional policy addresses both the efficiency issue (e.g. making places more attractive for workers and firms so as to increase the business propensity of territories), and the equity issue (e.g. ensuring a minimal level of essential services throughout the country). In order to meet public goods and service provision goals, an incentive mechanism is being implemented according to the ongoing seven-year strategic planning period (see Italian National Strategic Reference Framework[1]). The mechanism sets minimum service provision targets (based on the national or European average) for a set of 11 collective public services that southern regions are committed to improving, both in terms of availability and quality of provision. The selected services are fields where southern Italian regions persistently lag behind the rest of the country and which are deemed crucial to increase the effectiveness of development policy in those particular contexts. They include: education; child care and assistance of the elderly; and water supply and waste management. Funding allocations also reflect the different starting positions of each lagging area. Indicators and targets have been selected on the basis of in-depth consultations between the central government and the regions. The central government has set aside EUR 3 billion that will be allocated to regions in the form of an additional grant (rewards) at the end of the 7-year strategic planning period (in 2013), in proportion to the achievement of the targeted objectives. A share of the funds was assigned in 2009 on the basis of improvement from the baseline. Resources not assigned to regions that do not achieve the targets can be assigned to other better performing regions.

The incentive mechanism aims at increasing the responsiveness of public policies to structural disadvantages that may hamper economic growth and citizens' quality of life in lagging areas. Moreover, explicit targets make the public authorities responsible for the delivery of the selected services more accountable to other levels of government and to people and firms.

1. For details of the Italian National Strategic Reference Framework, see *www.dps.tesoro.it/documentazione/QSN/docs/QSN2007-2013_giu_07.pdf.*

Rather than trying to induce export-based firms to relocate from the Inner PRD, Guangdong authorities could consider developing a regional development policy for the province aimed at redirecting investments and policy efforts to strengthening existing comparative advantages in the core industries of cities and towns in peripheral regions. Existing core industries are already growing in importance in three out of four municipalities in the Eastern Region, three out of five in the Northern Region, and all three in the Western Region. These include, for instance: *i*) Shantou in the Western Region, which is highly diversified and strong in textiles, plastics, toys and decorations, paper, and timber processing (highly productive provincially); *ii*) Qingyuan in the Northern Region, which has a diverse industrial economy that is highly productive in non-ferrous metals processing, non-metallic mineral production, machinery, leather products, furniture manufacturing, electrical machinery, cultural products; *iii*) Zhanjiang in the Western Region, which focuses on food processing, petroleum and natural gas, and petrochemicals (highly productive provincially). Korea currently has an interesting programme called "5+2 Economic Region", which focuses investment in endogenous assets of each region. In particular, Korea's current approach demonstrated its shift away from industrial relocation that was discussed earlier (Box 3.13).

Box 3.13. **Korea's 5+2 Economic Regions and their propulsive industries**

After decades of efforts to decentralise Seoul that delivered limited results in promoting development in lagging peripheral regions, the current regional development policy has shifted to the "5+2 Economic Region" approach since 2008. The new approach sets out leading projects in each economic region that institutional bases will carry out. The five economic regions are: the Capital Region, Chungcheong Region, Honam Region, Daegyeong Region, and Dongnam Region. Each of these regions has a population over 5 million. The two special economic regions, whose population is around 1 million, are Gangwon Region and Jeju Region. The government created a standing regional agency to make regional economic development plans and to promote inter-regional co-operation. The 3 key elements of the economic regions strategy include: i) the priority provision of 30 infrastructure projects; ii) the selective investment of 2 propulsive industries for each economic region (e.g. Expansive Medical Industry and Healthcare tourism for Gangwon Region); and iii) the designation of hub universities to gear for propulsive industries. In the early phase, the central government will lead regional development by pilot projects so as to provide development momentum for each economic region. Each economic region in close consultation with the central government will draw its own vision for development.

The new approach clearly recognises that regional propulsive industries could not be planted by relocation of other regions' industrial resources. The policy goals are therefore giving various promoting measures to developing identified industries in the designated regions. Such policy measures include industrial complex, innovation cluster, and other supplementary measures. Although these regions will also benefit from receiving firms relocating from other regions, they are receiving business that is compatible with and could enhance the region's endogenous industries. Such relocation is also encouraged, for instance from the Capital Region, for instance, corporate and income tax benefits could be extended from 7 to 10 years.

Building on the strength of public services provided and investments in endogenous assets, future policy goals could promote innovation capacities in rural regions. Innovation is not merely the privilege of advanced urban/metropolitan regions. Many innovations in health, housing and transport have emerged primarily in response to growing demand in the primary rural sectors such as the need to transport minerals,

agricultural products or wood to ports or cities. For instance the use of rural waste management techniques – such as composting waste – could spark new ways of managing waste in cities (Mahroum *et al*., 2007). There are at least four key areas for public policy to stimulate rural innovation. First, human capital development is a key driver of rural innovation; this could be achieved through widening access to higher education and adult education. Second, financial services need to be developed to support innovative rural enterprises, in which higher risks and costs could be mitigated by development banks and agencies. Third, bridging digital divides and developing ICT use is crucial for the future of rural areas, which provide new ways of overcoming the geographical disadvantages of remote and peripheral areas. Fourth, co-operative approaches and institutional innovation need to be further developed, so as to shift from traditional sectoral approaches (e.g. subsidies) to multifaceted policies for rural regions (e.g. place-based, integrated focus) (OECD 2007c). The collective impact of these four key approaches to stimulating rural innovation has shown to enlighten new synergy and create new economic opportunities in rural areas, as demonstrated in the case of southern Minnesota in the United States (Box 3.14).

Box 3.14. **Fostering industrial upgrade and building a regional innovation system for a rural region – the case of southern Minnesota, United States**

Southern Minnesota is a rural region located in the state of Minnesota, in the Midwest of the United States. The region is comprised of 38 counties stretching across the southern third of the state, with a total population of 988 000. Recently, the region's economy has been heavily dependent on three main sectors: food and agriculture, health care, and manufacturing. However, two particularly worrying trends have been challenging this region: a persistent slide in per capita incomes and the ongoing exodus of its young people. Per capita incomes in the region have been about 82% of the state average, and appeared to be declining. What is more, 35 of the 38 counties across the region have lost population over the past 25 years. The exodus is concentrated among those younger than 45. The outmigration has been driven in part by ongoing consolidation in farming.

Main method of generating regional development policy

These challenges have been tackled by the Southern Minnesota Competitiveness Project started in 2008. The programme has four principal goals: i) strengthen collaboration and the region's framework for development action; ii) identify what the region does best in the global economy; iii) prioritise public investments critical to making the region a world-class leader; and iv) enhance the region's capacity to innovate, grow entrepreneurs and create wealth.

Translating the stated objectives to concrete policy strategies and actions has made the project bring together two activities: i) analysing the region's best economic options (structural analysis, business cluster analysis, impact analysis and innovation capacity analysis); and ii) facilitating a region-wide dialogue on the region's best strategy. The dialogue engaged more than 1 000 public, private and non-profit leaders from all corners of the region and from all types of organisations. Ten local roundtables, three regional roundtables, a Futures Summit, and several meetings among project partners were convened over the one-year period. These events had four main objectives:

- pool knowledge about the region's economy, including a thorough mapping of the region's distinct economic assets;
- identify unexploited opportunities, focusing attention not on what is but what could be;

Box 3.14. **Fostering industrial upgrade and building a regional innovation system for a rural region – the case of southern Minnesota, United States** (*continued*)

- weigh strategic opportunities, gathering input to craft the best possible strategy for future economic development;
- inform the region, providing objective information on the region's challenges and opportunities, and show the benefits of regional collaboration in seizing new opportunities.

Main components of the regional development policy

Project findings inform and influence the region's strategy, which relies on three main pillars. The first is forming an enabling organisation to steer the strategy, implement it, and monitor it over time. The second is seizing the opportunity to build powerful new economic engines in bioscience and renewable energy, drawing on the region's current strength in manufacturing, health care, and food and agriculture. The third is bolstering the region's capacity to innovate, grow new businesses, and create wealth.

The region has established an enabling organisation to implement its Economic Plan. The main functions of the organisation include: i) it must set key investment priorities based on consensus of the region; ii) it must champion public policies critical to the region's future, since these provide the critical context for its opportunities; iii) it must foster the best possible conditions for bringing about economic synergies; iv) it must co-ordinate a wide range of actions in the plan with an overriding goal of ensuring the whole is greater than the sum of the parts; v) it must track progress against the milestones set out in the plan, recommending to the region mid-course corrections when necessary.

Building on the consensus of seizing new opportunities, the region's transforming strategy has two main elements. The first element is to recognise the importance of the region's current three main sectors, but focus the region's development strategy on the most promising opportunities identified in this project. The second element is to target the region's development strategy on bioscience, renewable energy, and the high-tech sector. Advanced manufacturing is also part of the mix, though probably in a supporting role.

The innovation capacity enhancement has been managed in three steps. First, the innovation engines throughout the region have been connected in ways that spark new synergies for economic growth. Second, the region has built a stronger support system for its entrepreneurs. Third, new equity funds have been built to harness the region's wealth and propel new enterprise.

Notes

1. During 2003-2008, due to concerns over the proliferation of industrial parks outside of the regulated land conversion quota system, the central government sent out inspection teams to order mostly vacant parks to be shut down and revert to agricultural use in almost all provinces. However, actual closures were slow (Kamal-Chaoui *et al*., 2009).

2. Kamal-Chaoui *et al.* (2009) analysed China's decentralisation as "offloading" and "usurpation", which is a characteristic of unbalanced authority, responsibility and fiscal autonomy. This is more clearly observed in the analysis of the real estate transactions of local governments.

3. For an example of the lack of fiscal autonomy, provincial governments cannot determine either the base or the rates of local taxes (OECD, 2009f). Revenues from the leasing of land-use rights accounts for 30-50% of annual fiscal revenues for most cities, and up to 80% in smaller cities (Huang Xianjin, 2005, cited in Kamal-Chaoui *et al.*, 2009). OECD (2010c) describes that "transfer payments are not sufficient to compensate for eliminated official sources of revenue and do not represent a major part of resources. Income from land-related transactions (sales and contract payments for land) increased by almost 50% between 2000 and 2004, illustrating the fact that villages try to tackle financial gaps with revenue from land and asset sales". Ding (2005) also reports that "more than one-third of county-level governments have serious budget problems and over half of the local governments directly below the provincial level have budgets that merely cover the operations of public entities.

4. During the process, Guangdong's Kaiping city's 4 senior officials, including the party secretary and the mayor, were sacked by the central government, for illegal land leasing approval of 1 985 hectares against the central authority. (Shanghai Daily, December 2007, *http://china.org.cn/english/government/235075.htm*).

5. It has to be underlined that one city can have more than one specialised sector. Dachong, for example, is officially recognised as a town specialised in the production of mahogany furniture and in the production of clothing (even if the furniture industry is predominant).

6. Since 2001 a research group co-ordinated by the University of Ferrara has promoted fieldwork and data collection at specialised town level that have led to the building of the "*CIRLP database*, University of Ferrara" (since then constantly updated). In particular, data were gathered starting from the official statistics provided to the research group co-ordinated by the University of Ferrara directly by representatives of the Department of Science and Technology of Guangdong province (DSTGG), which is, as already mentioned, the main governmental body in charge of the design and implementation of the policy supporting the development of specialised towns. Furthermore, in order to carry out a detailed analysis of the different aspects related to the performance, evolution and growth

of the specialised towns, the information provided by the DSTGG has been integrated with more specific sources, such as other official documents, publications and websites of the Department of Science and Technology, or the Research Development Centre of Guangdong province and the South China University of Technology. Given the important role played by local institutions for the development of specialised towns and considering the main local dimension of the phenomenon, the research group then started to collect data and information from local governmental bodies as well, when possible by means of field case studies and interviews to relevant stakeholders (mayors, chiefs of the town, party representatives, entrepreneurs, policy makers in charge of the innovation centres, etc.). Finally, a long phase of crossed controls has been promoted in order to minimise the risk of mistakes, inconsistencies and unreliable information.

7. These policy measures include: the Implementation Plan of Technology Innovation Pilot Programme in Specialised Towns (2000-2005), the Guiding Opinions on Provincial and Municipal Co-actions of Promoting Specialised Towns (2005), the Opinions from Guangdong Provincial Government on Accelerating Development of Specialised Towns (2006).

8. For a more detailed analysis of how leading firms in STs respond to innovation policies of the government, see Barbieri, Di Tommaso and Huang (2009).

9. This has been the case, for example, of the "China Ceramic Exposition" in Shiwan (Foshan), of the "China Flower Expo and China Flower Trade Fair" held in Chencun (Foshan), and of the "China International Lighting Fair" in Guzhen (Zhongshan).

10. The idea to build a *xiaokang* society in which all people can live a fairly comfortable life is particularly interesting: after Den Xiaoping's first elaboration in the 1980s, it was reused (and redefined) by former President Jiang Zemin and President Hu Jintao to describe "Chinese-style" modernisation and notion of prosperity. The 17th National Congress of the CPC in 2007 has reiterated the long-term objective of a *xiaokang* society to be reached in 2020 and included in the concept criteria for economic growth, establishing the objective to quadruple the GDP per capita of the year 2000 by 2020 (OECD, 2009c).

11. In the 11th Provincial FYP, there were no concrete or quantitative development targets for Guangdong's sub-regions to monitor the progress of each sub-region.

12. The Pan PRD is an economic zone planned by Guangdong and its neighbouring eight provinces (Fujian, Jiangxi, Hunan, Guangxi, Hainan, Sichuan, Guizhou, Yunnan), together with Hong Kong, China and Macao, China.

13. ASEAN is the Association of Southeast Asian Nations, which is a geo-political and economic organisation of ten countries located in Southeast Asia, including Indonesia, Malaysia, the Philippines, Singapore, Thailand, Brunei, Burma (Myanmar), Cambodia, Laos, and Vietnam.

14. In September 2008, a large team from Beijing (more than 200 top specialists from ministries, institutes, and academe) was formed, headed by the NDRC. Intensive field missions were conducted over the next two months. By December, the plan had been prepared, reviewed by the State Council and later that month released as a national policy document.

15. In September 2008, the State Council approved and released the "Guiding Opinions on Further Promoting the Reform, Opening-up and Social-Economic Development of the Yangtze-River Delta Region".

16. In general, there have been different electricity prices for industrial, commercial, residential and the agricultural sectors in non-PRD. Normally the commercial sector has the highest electricity price whilst the industrial sector has the lowest. The possibility of reducing the price of electricity is to make all prices benchmarking the lowest level in the non-PRD. Therefore, the target in non-PRD is to reduce the price of electricity to lower than the prices in the PRD.

17. As of late 2008, the Guangdong provincial government launched the "New Ten Projects", a CNY 2.27 trillion (USD 324 billion) programme over 2008-2012 aimed at triggering the development of a wide range of industries, and to hold back or even to reverse the economic downturn in the global financial crisis and economic slowdown (China Daily, 2008).

18. For further details see Hong Kong Trade Development Council (2006).

Chapter 4

Environmental and climate change challenges in Guangdong

This chapter analyses Guangdong's main environmental and climate change challenges, as well as existing and potential policy responses. Section 1 of this chapter analyses the links between economic growth and environmental degradation in the Greater Pearl River Delta, with particular focus on energy consumption and shortages, water and air pollution, and greenhouse gas emissions. Section 2 explores the potential impacts of climate change on Guangdong and the economic losses associated with inaction. Section 3 discusses existing policy responses, as well as implementation challenges, and areas in which action on environmental priorities could be expanded.

Introduction

Environmental quality has become a major factor in economic growth and regional development, and presents a fundamental challenge for the province of Guangdong. Energy-inefficient industries exacerbate energy shortages and contribute to greenhouse gas emissions levels. High levels of air and water pollution limit urban development and discourage foreign investment, particularly industries higher up the value chain. The rapid development of industries in low-lying areas puts the province's economy at risk of rising sea levels. Guangdong's position in the Greater Pearl River Delta affects the environmental quality and economic activity of Hong Kong, China, with implications for the future growth of one of the world's key economic centres.

National, regional and city policy priorities have begun to address these challenges, but they are in their initial stages. Industrial energy efficiency targets, promoted by the central government and expanded by Guangdong province and the cities of Guangzhou and Shenzhen in particular, could be strengthened and better co-ordinated to overcome implementation challenges and local industrial and residential resistance. Renewable energy technologies deserve even greater support by expanding current regulations and assistance programmes. Adaptation to climate change has yet to attract the kind of political attention needed to adequately prepare for the economic effects of rising sea levels, more severe storms, and increases in urban temperatures. Co-ordination with Hong Kong, China would focus the need for a holistic approach to combating air and water pollution and energy consumption in the Greater Pearl River Delta region and benefit from Hong Kong, China's experience in meeting these challenges.

Section 1 of this chapter analyses the links between economic growth and environmental degradation in the Greater Pearl River Delta, with particular focus on energy consumption and shortages, and water and air pollution, and greenhouse gas emissions. Section 2 explores the potential impacts of climate change on Guangdong and the economic losses associated with inaction. Section 3 discusses existing policy responses, as well as implementation challenges, and areas in which action on environmental priorities could be expanded.

4.1. Environmental impacts of urbanisation

The extraordinary rate of urban and industrial growth in Guangdong province has come with a cost: high energy demand has been accompanied by energy shortages, air pollution, and greenhouse gas emissions. Industrial and urban activities have also taken a toll on the water quality of the Pearl River Delta watershed. These environmental effects not only threaten resource availability, public health and climate change vulnerability, but they also endanger future economic growth. Continuing to industrialise and urbanise without regard to environmental impacts will increase the cost and decrease the availability of the very resources needed for growth: energy, water, and environmental quality (low pollution) attractive to industries high in the value chain. While Guangdong province and the cities of Guangzhou and Shenzhen have emerged as national frontrunners on initiatives to address energy consumption and resource efficiency, the continued pace of urban and industrial growth demands more comprehensive and long-term responses.

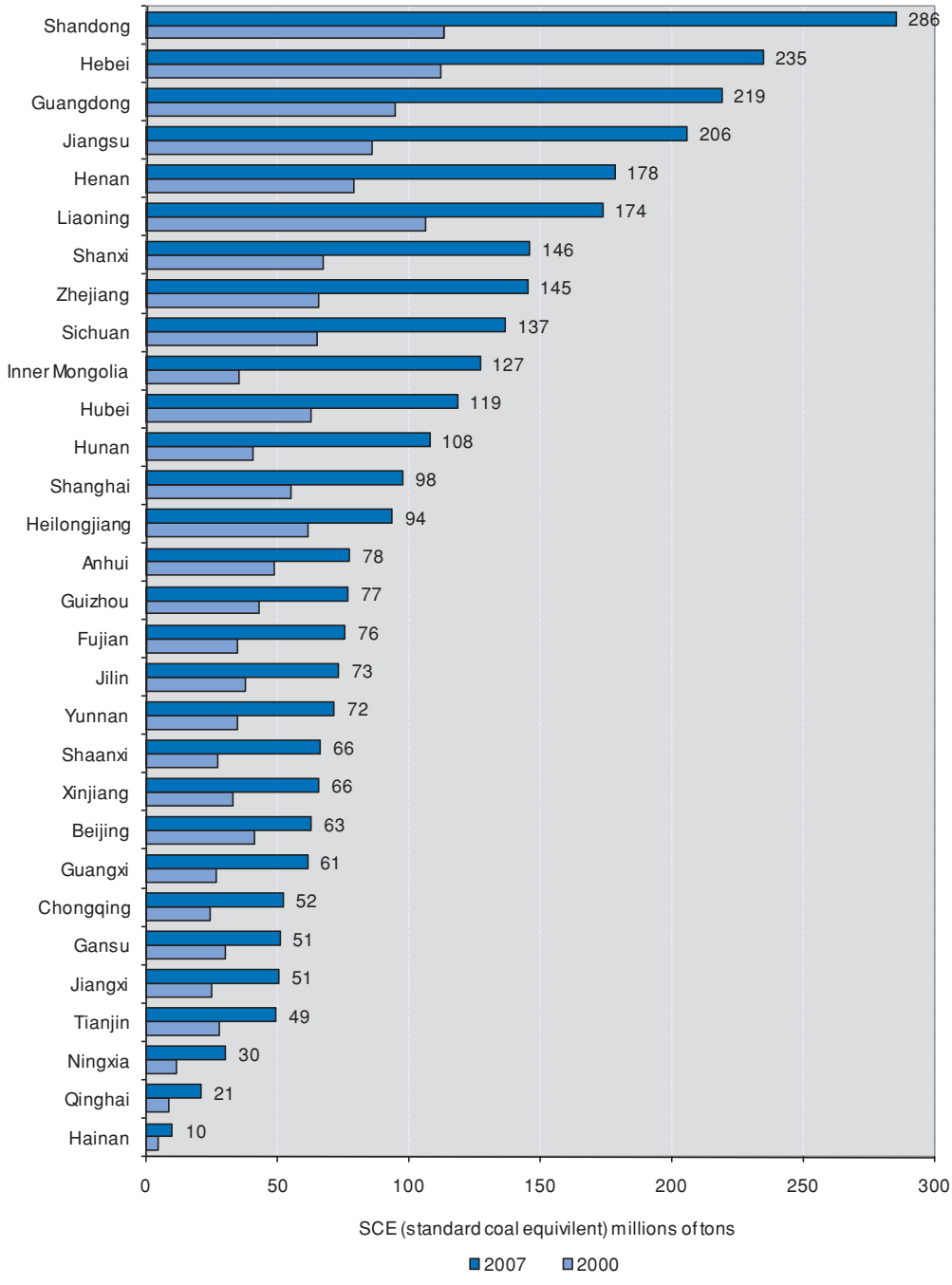
A growth model based on high energy use

Led by the cities of Guangzhou and Shenzhen, demand for energy in Guangdong has increased markedly, making the province one of the most energy intensive and highest energy consumers in China. Reflecting the province's increasing industrialisation, Guangdong's total energy consumption almost tripled over 1997-2007, and has doubled since 2000 (*NBS China database*). While Guangdong was the fourth largest energy-consuming province in China in 2000, it ranked third nationwide in 2007, surpassing Liaoning province (Figure 4.1). This occurred despite efficiency improvements and relatively low provincial energy intensity (tons of coal equivalent per CNY 10 000 of GDP). Guangdong's energy intensity did decline from 0.98 in 2000 to 0.72 in 2008, and it is now the second most energy efficient province in China, just below Beijing, but this is primarily due to the region's high GDP (*NBS China database*).

The presence of low value-added and energy inefficient factories in the PRD still pose a key problem. Electricity consumption alone more than doubled from 133 TWh in 2000 to 350 TWh in 2008 (*NBS China database*). The source of Guangdong's energy matters to the carbon intensity of energy production. The proportion of Guangdong's fossil fuels (coal and crude oil) accounted for 76.2% in 2007, although this represents a decrease from 2000 (*GBS database*). Guangdong uses more oil than any other region (Chen & Bai, 2008).

Consistent with national and global trends, industrial activities in the Pearl River Delta (PRD) region, particularly the cities of Guangzhou and Shenzhen are responsible for the vast majority of the province's energy consumption. Although detailed emission data are not available at the urban scale, Guangdong's largest share of GHG emissions is assumed to be from the urbanised PRD region, which accounts for 82% provincial industrial production (*GBS database*). This is consistent with global trends. A recent analysis of the International Energy Agency (IEA) estimates that 60-80% of world energy use currently emanates from cities; in China this figure is 75% and growing (Table 4.1). By 2030, cities in China are projected to represent 83% of the country's energy demand (IEA, 2008). While changing lifestyles contribute to the growing demand for energy, industrial activity still accounts for the largest share of the province's energy demand. Guangdong's primary industries – electronics, plastics, textiles, toys, porcelain, petrochemicals, automobile manufacturing and machinery – are high energy consumers. More energy is used in the chemical industry than all the cars in China combined. The steel industry produces more carbon dioxide than all the residential homes in China put together (Green-Weiskel *et al.*, 2009).

Figure 4.1. **Trends in total energy consumption of Chinese provinces**



Source: *National Bureau of Statistics of China database, www.stats.gov.cn/english/statisticaldata/yearlydata*; *CEIC database, www.ceicdata.com.*

Table 4.1. **Chinese energy demand in cities by fuel in the Reference Scenario**[1]

	2006		2015		2030		
	Mtoe	Cities as % of national	Mtoe	Cities as % of national	Mtoe	Cities as % of national	2006-2030[2]
Coal	1 059	87%	1 665	88%	2 206	90%	3.1%
Oil	271	77%	428	77%	648	80%	3.7%
Gas	40	81%	84	82%	158	84%	5.9%
Nuclear	12	84%	39	84%	67	87%	7.5%
Hydro	31	84%	52	84%	76	87%	3.8%
Biomass and waste	10	4%	12	5%	37	76%	5.6%
Other renewables	2	45%	9	62%	27	67%	12.2%
Total	1 424	75%	2 289	79%	3 220	83%	3.5%
Electricity	161	80%	314	80%	495	83%	4.8%

Note 1: The Reference Scenario represents the core projections derived from the IEA World Energy Model (WEM), which draws on the most recent historical data and revised assumptions, and indicates what would happen if, among other things, there were to be no new energy policy interventions by governments beyond those already adopted by mid-2008.

Note 2: Average annual growth rate.

Source: IEA (2008), *World Energy Outlook 2008*, OECD/IEA, Paris.

Beyond the energy used in manufacturing processes, buildings are an important source of energy demand in Guangdong. Building energy consumption in Shenzhen accounts for 30% of total energy consumption in the city, and in 2006 Shenzhen's energy consumption per unit represented twice as much as the average consumption of buildings in Beijing or Shanghai, and more than three times the average of buildings in western countries (OECD, forthcoming, citing *Nanfang Daily*). Peak consumption may be even greater. According to a representative of the Guangdong Economic and Trade Commission, 35% of the province's total electricity power load is used by air conditioners during the summer, the peak season for energy consumption (Xinhua News Agency, 2006).

A sharp rise in energy demand has been coupled with the difficulty in recent years of securing regional energy sources. Most of Guangdong's energy needs are met by external sources (OECD, forthcoming, citing *GBS database*). Energy shortages have led to regular blackouts that risk restraining future growth if not addressed (Box 4.1). Recurring energy shortages have had the greatest impact on economic activities in the PRD region (China Daily, 2007), which raises the question of reliability of supply to the peripheral regions that have been targeted for the relocation of industrial parks (see Chapter 3). Although the global financial crisis of 2008-2010 caused exports to severely decline and resulted in a sharp decrease in electricity demand, energy supply capacity will remain an important issue for economic growth as the economy recovers (OECD, forthcoming).

Box 4.1. **Energy shortages in Guangdong**

Guangdong has experienced severe power shortages in recent years (Xinhua News Agency, 2006; Chen and Bai, 2008). In 2008 the shortfall at peak demand was estimated at 10 gigawatts. Power cuts were directed first towards sectors that were strong polluters and consumers of energy, including small steel plants. The head of Guangdong's Development & Reform Commission foresaw a supply shortage of at least 6 gigawats to continue through 2010-11 (Chen and Bai, 2008).

Due in part to pressures on the electricity grid brought on by winter storms in Guizhou province, the source of much of Guangdong's power supply, these energy shortages highlighted the lack of adequate power supplies within Guangdong province. They have resulted in a reversal on a policy that had aimed to shut down small oil and gas-based power producers to lower pollution and reduce costs. Guangdong province instead postponed closures and provided subsidies to accelerate the addition of new capacity (Chen and Bai, 2008).

Source: Chen, A. and J. Bai (2008), "China's Guangdong Faces Severe Power Shortage", Reuters UK, 6 March 2008, *http://uk.reuters.com/article/idUKL0640101120080306*; Xinhua News Agency (2006), "Energy Shortages to Continue in Guangdong", Xinhua News Agency, 26 July 2006, *www.china.org.cn/english/environment/175813.htm*.

The pollution effects of industrialisation and urbanisation

Guangdong's rapid growth has not only threatened future growth through unsustainable energy use, but also depleted air and water resources. Air and water quality has begun to pose serious health and economic threats as it has been diminished by pollution from coal plants, chemical processes, urban wastewater and the increasing motor vehicle to move labour and materials around the region. Addressing water and air pollution is costly for Guangdong, and for China as a whole, where damages from air pollution represent 3.8% of the GDP, and water pollution can cost nearly 2% of GDP (OECD, 2007b). Lack of sufficient clean water supplies and healthy air quality risks discourage new industrial investment to Guangdong, particularly industries that are higher up the value chain.

The coal-fired energy plants that have met a large share of Guangdong's increasing power demands have also resulted in large amounts of emissions of sulphur dioxide (SO_2), nitrogen oxides (NO_x), volatile organic compounds (VOC), and respirable suspended particulate matter (RSP), which can have a greatly negative impact on public health. It is estimated that 10-40% of these emissions in the PRD are a result of manufacturing for export (Streets *et al.*, 2006). As a result, the PRD region is one of the four regions in China most affected by the problem of haze (Lee and Savtchenko, 2006). The provincial average SO_2 concentration increased 14% in the last 7 years, from 0.022 mg/m^3 in 2001 to 0.025 mg/m^3 in 2008 (Guangdong Provincial Environmental Protection Commission, 2001; Guangdong Provincial Environmental Protection Commission, 2008). Increasing SO_2 concentrations also contribute to acid precipitation in Guangdong, which contributes to the deterioration of buildings as well as bodies of water and forests in the province. Guangzhou is classified as one of the most severely acid precipitation polluted cities in the province. By 2008, 48.5% of annual rainfall events in Guangdong's cities were classified as acidic, up from 44.4% in 2001, and 62% of cities in the province experienced frequent acid rains (Table 4.2). It is estimated that state-of-the-art pollution emission controls could be implemented at

a cost representing 0.3-3% of the value of Guangdong's goods for export (Streets *et al.*, 2006).

Table 4.2. **Acid rain indicators in Guangdong cities**

Precipitation in cities	2001	2008
Provincial average pH value of acid rain	4.82	4.88
% of rain per year classified as acid precipitation	44.40%	48.50%
% of cities in the province with frequent acid precipitation pollution (average pH <5.6)	–	61.90%
% of cities in the province with severe acid precipitation pollution (average pH <4.5 or 4.5<pH<5.0 with acid precipitation frequency over 50%)	38.10%	42.90%

Source: Guangdong Provincial Environmental Protection Commission (2001), *Guangdong Provincial Bulletin on Status of the Environment*, Guangdong Provincial Environmental Protection Commission Publishing, Guangzhou, China; Guangdong Provincial Environmental Protection Commission (2008), *Guangdong Provincial Bulletin on Status of the Environment*, Guangdong Provincial Environmental Protection Commission Publishing, Guangzhou, China.

Motor vehicle emissions are also key contributors to pollution, public health problems and reduction in attractiveness, as they increase the amount of particulate matter, carbon monoxide (CO) and nitrogen oxides (NO_x) pollution in the air. Motor vehicle population has grown rapidly both in Guangdong and in China as a whole, where the number of motor vehicles has almost tripled during the past 10 years, from 56 million in 2000 to 170 million in 2008. Guangdong now accounts for 10% (17 million) of China's total number of motor vehicles (Ministry of Public Security – MPS, 2009). Emissions of nitrogen dioxide (NO_2) and inhalable particulate matter (IPM) have declined slightly during this period province-wide, but the provincial average masks significant concentrations in the PRD. The IEA and the World Business Council on Sustainable Development have recently prepared projections of motorisation and associated NO_x from motor vehicles that show, in a conservative baseline scenario, a 72% growth in road vehicles in China from 2005 to 2015, accompanied by a 35% growth in NO_x emissions only from light duty vehicles. Most of this growth will occur in and around metropolitan regions. Despite the documented health and visibility effects associated with motor vehicle emissions, no regulations on transport pollution exist apart from specifications of fuel type. The ongoing decline in air quality has demonstrated that any air quality gains resulting from regulations of fuel type have been counteracted by the rapid increase in the number of motor vehicles.

The negative impacts of air pollution affect economic activities in the entire Greater PRD region. Of ten days of air pollution episodes occurring in Hong Kong, China in 2003-2004, half coincided within two days of the most polluted days of that month in the PRD. On two other episode days, the most polluted days in the PRD occurred within two days of the Hong Kong, China episodes. The problems of air pollution affecting the Greater PRD and its ability to attract high value-added economic activity speak to the need for co-ordination among the key cities in the area, in order to improve the air quality of the whole region (Lee and Savtchenko, 2006).

Wastewater pollution from industry and residences has grown with increased urbanisation and industrialisation. From 1992-1998, increases in industrial output were correlated with increases in industrial wastewater discharges and, similarly, increases in per capita GDP was correlated with increases in domestic wastewater discharges

(Zhu *et al.*, 2002). Wastewater discharges increased by 32% across the province from 2001 to 2008 (Table 4.3). Reflecting huge investments in domestic wastewater treatment plants since 2000, the treatment rate has increased substantially from 30.6% in 2001 to 56% in 2008. However, over 2 billion cubic meters of domestic wastewater is still being discharged across the province without any treatment. While treatment rates for industrial wastewater are almost 90%, total industrial wastewater demand grew significantly from 2001 to 2008, such that there has been an actual increase in industrial wastewater discharges from 210 million cubic meters in 2001 to 220 million cubic meters in 2008 (Table 4.3) (Guangdong Provincial Environmental Protection Commission, 2001; Guangdong Provincial Environmental Protection Commission, 2008).

Table 4.3. **Waste water indicators in Guangdong**

Wastewater	2001	2008
Annual amount of wastewater (billion m^3)	5.11	6.77
Amount of domestic wastewater (billion m^3)	3.99	4.64
% of domestic wastewater treated	30.60%	56.00%
Amount of domestic wastewater discharged without treatment (billion m^3)	2.77	2.04
Amount of industrial wastewater (billion m^3)	1.13	2.13
% of industrial wastewater treated to environmental standards	81.80%	89.70%
Amount of industrial wastewater discharged without treatment or treatment to standard (billion m^3)	0.21	0.22

Source: Guangdong Provincial Environmental Protection Commission (2001), *Guangdong Provincial Bulletin on Status of the Environment*, Guangdong Provincial Environmental Protection Commission Publishing, Guangzhou, China; Guangdong Provincial Environmental Protection Commission (2008), *Guangdong Provincial Bulletin on Status of the Environment*, Guangdong Provincial Environmental Protection Commission Publishing, Guangzhou, China.

The majority of industrial and domestic wastewater is discharged into the province's rivers, and the rivers in the Pearl River Delta watershed are most at risk (Table 4.4). While 10.2% of river segments in 2001 had good water quality (Class I), by 2008 no river segments could meet Class I water quality standards. In 2008, 35.1% of river segments in the province were polluted (Class IV and lower). All extremely polluted rivers with water quality worse than Class V in Guangdong were located in the PRD. Only slight improvements have been made in the last 7 years as the proportion of extremely polluted rivers decreased from 15.9% in 2001 to 14.4% in 2008, indicating minor decreases in water pollution in the PRD after substantial investments in wastewater treatment infrastructure. Despite these efforts, drinking water quality is highly compromised. In Guangzhou, only 82% of water for consumption met national standards in 2009. As in many OECD countries, substances from pharmaceuticals and personal care products are some of the water pollutants in the Pearl River Delta that result from untreated wastewater discharge or leaking. These include estrogens and endocrine-disruptors, which may interfere with the sexual development of children exposed to the substances (Peng *et al.*, 2008).

Table 4.4. **River water quality indicators in Guangdong**

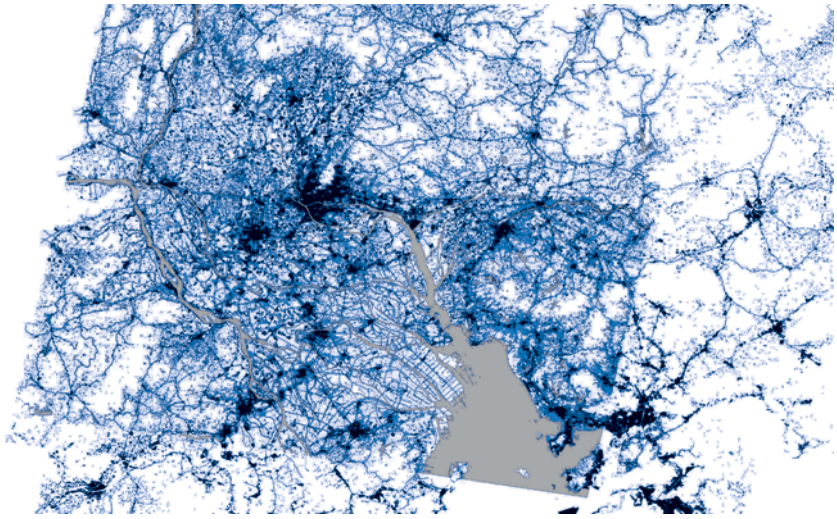
Water quality of rivers	2001	2008
Number of river segments with monitored water quality	59	111
% of river segments with Grade I water quality (high water quality)	–	10.20%
% of river segments with Grade II water quality (good water quality)	34.20%	40.00%
% of river segments with Grade III water quality (moderate water quality)	30.60%	3.40%
% of river segments with Grade IV water quality (polluted)	12.60%	18.60%
% of river segments with Grade V water quality (severely polluted)	8.10%	11.90%
% of river segments with water quality worse than Grade V (extremely polluted)	14.40%	15.90%

Source: Guangdong Provincial Environmental Protection Commission (2001), *Guangdong Provincial Bulletin on Status of the Environment*, Guangdong Provincial Environmental Protection Commission Publishing, Guangzhou, China; Guangdong Provincial Environmental Protection Commission (2008), *Guangdong Provincial Bulletin on Status of the Environment*, Guangdong Provincial Environmental Protection Commission Publishing, Guangzhou, China.

Unsustainable growth patterns

Underlying Guangdong's rapid increase in energy demand and water and air pollution are unsustainable growth patterns, which have developed in the absence of a PRD-wide, integrated development strategy. As introduced in Chapter 1, Guangdong is the most urbanised province in China, with an urbanisation rate of 63.4% in 2008. From 1990 to 2000, built-up land area in the Inner PRD grew by over 300% in a pattern of sprawl that was hitherto unknown in China (Figure 4.2).The result has been enormous diseconomies of scale in the form of duplicated facilities, network inefficiencies, uneven standards and maintenance practices that undermined assets' life cycles, and uncontrolled suburban and corridor development (see Section 1.2). Urban sprawl also puts pressure on city budgets and the delivery of public services, as it increases the distance and cost of service delivery and erodes the open space and natural resources that provide key urban amenities (Green-Weiskel *et al.*, 2009).

Figure 4.2. **Built-up land in the Pearl River Delta: 1990 (black) and 2000 (blue)**



Source: Internal document from Chreod.

A major factor in urban sprawl and unmanaged spatial growth is that a large part of Chinese cities' revenue, including that of metropolitan cities in Guangdong, depends on land-related income, such as land leases, land auctions and land development rights. The contribution of land sales to local revenue in Guangzhou has been estimated to be 55% in Guangzhou in 2006 and around 80% in the city of Shenzhen throughout the 1990s (Tian and Ma, 2009; Peterson, 2006). Although these can be valuable instruments to capture land value increases and to finance infrastructure, in practice local governments in China have been so motivated to generate revenues from land sales and leasing that they have generated an oversupply of land for construction. This has stimulated sprawled development and loss of cultivated land. Concerns over rampant conversion of agricultural land have triggered periodic inspections and clampdowns by the Ministry of Natural Resources and Lands, but the basic problem remains that, under the current fiscal system in China, leasing of land-use rights accounts for a large proportion of local government financing (OECD, 2010b). Decentralised industrial growth and the lack of a land management or monitoring system have also contributed to unchecked urban sprawl and agricultural land conversion (Yeh and Li, 1999).

Greenhouse gas emissions

With its rapid increase in energy consumption, urban sprawl, and reliance on coal and oil, Guangdong has become a key contributor to China's total greenhouse gas emissions. Guangdong's carbon emissions have grown exponentially, far outpacing earlier estimates. As the primary manufacturing centre of China, Guangdong is a disproportionately large contributor to national greenhouse gas emissions, which are very high. Estimates of the annual growth rate of carbon emissions in China over 2004-2010 range from 2.5-5% (Intergovernmental Panel on Climate Change) to 11% (University of California at Berkeley and University of California at San Diego), with a conservative forecast predicting a 600 million ton increase in carbon emissions over the same period, surpassing the 116 million tons of reduction committed to by developed countries in the Kyoto Protocol (Green-Weiskel *et al.*, 2009).

The reliance on coal for energy generation ensures that energy consumption in Guangdong results in greenhouse gas emissions, but this does not have to be the case. Many cities across the OECD have developed innovative means of providing energy services cost effectively while reducing their contribution to greenhouse gas (GHG) emissions. These strategies include direct and indirect support of renewable energy technologies through public investments, agreements to pay a premium for renewable energy (feed-in tariffs), regulations and incentives; facilitating of energy efficiency through standards for new buildings and grants or public-private partnerships (PPPs) for existing buildings; land-use and transport policies to decrease distances between local economic and household activities, discouraging driving through congestion taxes and fees, and encouraging the use of public transit through service extensions and quality improvements; increasing the profitability of waste services and decrease landfill emissions through waste-to-heat and recycling programmes; and reducing the energy required to treat and deliver water through programmes to reduce water use and mandating the use of minimally treated water for non-drinking water purposes (Kamal-Chaoui and Robert, 2009). Several initiatives in Guangdong province and the cities of Guangzhou and Shenzhen are discussed below, but more could be done to pursue cost-effective, low-carbon urban growth and service delivery in a win-win approach.

4.2. Vulnerability to climate impacts

While industrial and urban growth has increased Guangdong province's contribution to GHG emissions, the province's economy and future development are also threatened by the potential impacts of climate change. Coastal flooding due to rising sea levels clearly puts economic activities at risk, but less dramatic changes are also a concern, including more frequent storms and inland flooding, and increased heat waves exacerbated by urban heat island effects. The current Exposure Index of the world's 444 metropolitan regions shows that cities in Guangdong (Shantou, Shenzhen, Guangzhou, Foshan, and Dongguan) and Fujian (Xiamen, Fuzhou) are among the most vulnerable to severe climate events.[1] Current and near-future infrastructure decisions regarding transport, buildings and development around the Pearl River Delta Estuary will determine the degree to which Guangdong's economy is vulnerable to future climate change impacts.

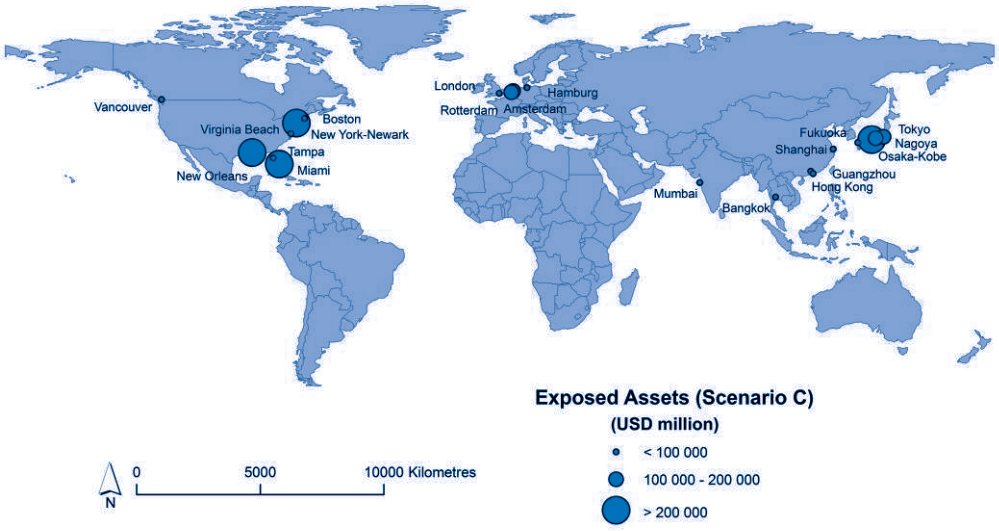
Rising sea levels

The Pearl River Delta region in Guangdong is highly vulnerable to coastal flooding, from rising sea levels and more intense storm surges and typhoons. Delta regions are often more at risk of coastal flooding because they are often located at lower elevations and have experienced land subsidence due to both natural and human causes (Nicholls *et al.*, 2008). With an average elevation of four metres above sea level, Guangdong is particularly vulnerable (Study Group on Guangdong Climate Change, 2007). A research report released by the University of Colorado on major deltas worldwide suggests that land in the PRD region is gradually sinking below sea level, and the areas of land vulnerable to flooding will increase by about 50% in the next 4 decades (Syvitski *et al.*, 2009). The Guangdong Climate Change Assessment Report (Study Group on Guangdong Climate Change, 2007) projects that sea levels will rise 30 centimetres by 2050, putting cities including Guangzhou, Zhuhai and Foshan at serious risk of flooding. Peak sea levels, which are the most relevant for coastal planning as they characterise storm surges, may be rising even faster than overall sea levels (Kamal-Chaoui and Robert, 2009). The coastal city of Shenzhen has developed a network of 2 000 automatic meteorological data collection stations, to provide a monitoring range of 250 kilometres (OECD, forthcoming)

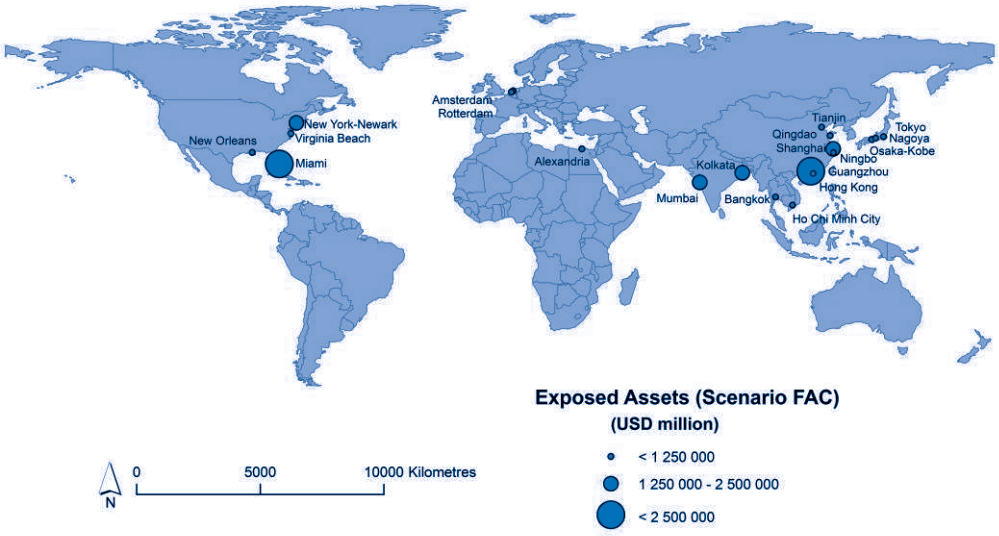
Rising sea levels and stronger storm surges greatly threaten economic activity in the PRD. An increase in the sea level of 30 centimetres would submerge an area of 1 153 square kilometres underwater. The cities of Guangzhou, Zhuhai and Foshan – home to many of the major manufacturers of toys, electronics and other commodities – are predicted to be the worst affected (Green-Weiskel *et al*. citing *China Daily*, 2009). In a recent OECD study of the exposure of 136 port cities around the world to coastal flooding due to climate change, Guangzhou and Shenzhen ranked among the top 20 cities with the most exposed population in 2005. Guangzhou ranked as the city with the second highest currently exposed population. In a scenario that modelled population and asset exposure in 2070 given climate change and natural and human land subsidence, Guangzhou ranked among the top 4 cities with the highest exposed population (Figure 4.3) (Nicholls *et al.*, 2008).

Figure 4.3. **Top 20 cities for exposed assets in 2005 and under the 2070 scenario**

Scenario current city (C): situation in 2005



Future city, all changes (FAC): future socio-economic situation with the 2070's climate change, natural subsidence/uplift and human-induced subsidence



Note: The size of the circles in Scenario C and the size of the circles in Scenario FAC indicate different ranges.

Source: Nicholls, R. *et al.* (2008), "Ranking Port Cities with High Exposure and Vulnerability to Climate Extremes," *OECD Environment Working Papers*, No. 1, OECD Publishing, Paris.

Storm impacts

Increasing coastal flooding, storm surges and high winds all threaten a growing amount of assets in Guangdong and the Greater Pearl River Delta as a whole, and storm events could significantly damage economic growth. More frequent storms and precipitation pose a threat beyond the coastal areas of Guangdong. Recent years have witnessed increasing frequency and intensity of extreme climate events in Guangdong, such as storms and associated surges in precipitation, resulting in infrastructure damage. More frequent storm events caused by climate change can lead to flooding and stress the capacity of drainage infrastructures, sewage systems and water treatment facilities in cities. The frequency and severity of flooding has generally increased worldwide in the last decade compared to 1950-1980 flood data (Kron and Berz, 2007 cited in Ruth and Gasper in OECD, 2008c) and more frequent severe precipitation events are predicted to cause a greater incidence of flash flooding and urban flooding (Ruth and Gasper in OECD, 2008c). In addition to the obvious structural damages and loss of life that they can cause, floods can short-circuit transformers and disrupt energy transmission and distribution, paralyse transport, compromise clean water supplies and treatment facilities, and accelerate the spread of water-borne pathogens (IPCC, 2001 and Ruth and Rong, 2006 cited in Ruth and Gasper in OECD, 2008c). Metropolitan regions need to evaluate existing infrastructure to better understand how the existing systems can handle excess precipitation or an influx of seawater.

Urban heat island impacts

Densely populated cities in the PRD will not only face risks from floods and rising sea levels, but also significant increases in temperatures and the frequency of heat waves. In the past 50 years, the average temperature increase in Guangdong as a whole has been 0.21ºC per decade, similar to China's national average, whilst the average temperature increase in PRD has been 0.3ºC per decade. Guangdong has been experiencing longer and hotter summers as well as warmer winters since 2000 (Study Group on Guangdong Climate Change, 2007). Heat waves are likely to increase in severity and duration in the future, contributing to heat mortality in both developed and developing countries. Temperature increases will likely be more strongly felt in urban areas, as cities tend to have higher air and surface temperatures compared to rural areas, known as the urban heat island (UHI) effect. UHI is due to the combined effects of structural interference with thermal radiation, low albedo of impervious surfaces and reduced transport of water into the atmosphere (Ruth and Gasper in OECD, 2008c, citing Oke). The UHI effect is suspected of warming urban areas 3.5-4.5°C more than surrounding rural areas and is expected to increase by approximately 1°C per decade (Corfee-Morlot *et al.*, 2009, citing Voogt). The temperature differences between urban and surrounding rural areas can reach up to 10°C for large urban agglomerations. (Corfee-Morlot *et al.*, 2009). Due to the UHI effect, heat waves can be worse in urban areas. For example, in the 2003 European Heat Wave, a higher percentage of the causalities in France came from urban areas (Hallegatte *et al.*, 2008). Climate change can also exacerbate the effects of urban air pollution as UHI effects can generate changes in local atmospheric cycles (Hallegatte *et al.*, 2008). One study estimates these effects in the New York metropolitan area to increase mortality rates in the 2050s due to ozone-related acute climate change impacts alone (Corfee-Morlot *et al.*, 2009, citing Knowlton *et al*. and Hunt and Watkiss).

Effects felt beyond the PRD: water scarcity, agricultural decline and rural-urban migration

Climate change is expected to significantly impact Guangdong province beyond the urbanised area of the PRD, particularly in the form of impacts on water availability and agriculture. Climate change may intensify competition for water, as current water management systems are designed for historical weather patterns, and salinisation of groundwater and surface water due to rising sea levels can reduce the availability of potable water. This will exacerbate the pressure on water resources caused by rising population, affluence and pollution (American Association for the Advancement of Science – AAAS, 2006). Cases of saltwater intrusion are nearly ubiquitous among coastal cities, including in Chinese deltas, such as the Pearl River Delta (Ruth and Gasper in OECD, 2008c, citing IPCC). Climate change may also increase the occurrence of harmful algal blooms in coastal marine waters (also known as "red tides") in Guangdong, which results in the large-scale die-off of marine life in the coastal area and is associated with shellfish poisoning in humans (Study Group on Guangdong Climate Change, 2007). A decrease in income in the Guangdong agricultural and fisheries sector due to a climate-related decrease in production could also increase the number of rural migrants to the urbanised areas of the PRD.

Economic impacts of climate change

Climate change presents direct and indirect economic impacts, which should be taken into account in determining the cost-effectiveness of adaptation measures. Direct costs from climate change impacts can be very high, especially when related to natural disasters and the rising sea level, as Figure 4.3 demonstrates. In the OECD analysis of 136 port cities, Guangzhou and Hong Kong, China ranked in the top 20 cities with the most exposed assets in 2005. In the 2070 scenario, both Guangzhou and Hong Kong, China's comparative asset exposure increased, with Guangzhou ranking as the city with the second highest amount of exposed assets, after Miami. Storms (Box 4.2) and flooding are among the most expensive disasters, with a single flood causing England, for example, to spend GBP 1 billion to repair damages in 2000 (Zoleta-Nantes, 2000 cited in Ruther and Gasper in OECD, 2008c). One study of New York City calculated projected damages of approximately 0.1% of gross regional product, annualised, and a probable maximum loss of 10-25% of GRP for one storm event (Hunt and Watkiss, 2007). The costs of shoreline retreat are also significant, estimated at USD 270 billion to 475 billion per meter increase in sea level in the United States and as much as one-third of annual GDP in developing nations (Ruth and Gasper in OECD, 2008c, citing IPCC).

Box 4.2. **The high costs of storms**

Storms are currently the costliest weather events in the developed world and some research, particularly from the insurance sector, quantifies the potential future costs of climate change. For example, Association of British Insurers - ABI (2005) estimated that by the 2080s, there would be a 75% increase in costs of insured damage in a severe hurricane season in the United States, a 65% increase in costs of insured damage in a severe hurricane season in Japan, and a 5% increase in wind-related insured losses from extreme European storms. Swiss Re recently estimated that the costs of a 100-year storm event in Europe could double by the 2080s with climate change (USD 50/EUR 40 billion in the future compared with USD 25/EUR 20 billion today), while Nordhaus (2006) assessed the economic impacts of hurricanes in the United States (on the Miami coast and New Orleans) and estimated that the average annual hurricane damage will increase by USD 8 billion (0.06% of GDP, at year 2005 income) due to the intensification effect of a CO_2-equivalent doubling. Other estimates indicate that the cumulative contribution of changing climate risk and socio-economic development are likely to double worldwide economic losses due to natural disasters every ten years.

Source: Hunt, Alistair and Paul Watkiss (2007), "Literature Review on Climate Change Impacts on Urban City Centres: Initial Findings", *OECD Environment Working Paper*, OECD Publishing, Paris.

4.3. Evaluation of policy instruments

The energy, pollution, and carbon emissions issues faced in Guangdong province have drawn policy responses from multiple levels of government, which have increased both the opportunities and challenges of addressing environmental degradation. Led by central government policy, these multi-level governance frameworks provide numerous opportunities for addressing the region's environmental degradation in a way that also enhances economic growth. However, the lack of co-ordination mechanisms and the divergence among local, regional and national environmental priorities hamper successful implementation. Furthermore, many initiatives take the form of plans and pilot projects, raising the question of how to turn policy innovations into full-scale policy interventions. Two key issues deserve more attention: co-ordination with Hong Kong, China on improving the environment of the greater Pearl River Delta, and meeting the need for climate change adaptation measures.

National policies

The central government has indicated the importance of the social and environmental dimensions of economic growth through legal frameworks regarding energy and climate change, which have in turn required or encouraged action on the provincial and local levels. The National 11th Five-Year Plan, which emphasises the efficient use of resources, provides key policy priorities regarding energy reduction. Following the national target of a 20% reduction in energy intensity (tons of coal equivalent per CNY 10 000 of GDP) over 2005-2010, Guangdong set a target of a 16% reduction in energy intensity (NDRC, 2006; OECD, forthcoming). The "National Climate Change Programme", initiated in 2007, provides the framework for government policies, programmes and technology initiatives to reduce greenhouse gas emissions. This was followed in 2008 by the State Council Information Office white paper, "China's Policies and Actions on Climate Change", which presented goals for

the use of clean coal, carbon sequestration, and the development of efficient and clean power-generating technology, such as large-scale combined-cycle units. The central government has also made provincial governments responsible for drafting their own climate change action plans and has provided them with technical support from experts in Beijing (OECD, forthcoming).

The national Energy Law, still under consideration after being delivered to the State Council for initial review in January 2009, is expected to provide a framework for 2 existing laws intended to reduce energy use, particularly use of fossil fuels. The Energy Conservation Law, which requires industrial and economic sectors (e.g. construction, transport) to cut energy consumption and encourage public transport provision, also specifies detailed responsibility and evaluation mechanisms concerning energy conservation. This law makes energy conservation a component of the performance assessment of local officials. The Renewable Energy Law promotes the use of various types of renewable energy, including hydroelectricity, wind power, solar energy, geothermal energy and marine energy. While mainly pertaining to energy, these laws also provide support for climate change goals. For example, the energy intensity target in the Energy Conservation Law, combined with China's efforts to lower its dependency on coal by increasing renewable energy use, is consistent with the latest announced carbon emission intensity target of 40-45% cut by 2020 over 2005 levels (State Council, 2009). While this presents promising movement on climate change, a number of laws could more fully incorporate greenhouse gas emissions reductions targets (Table 4.5). As well, the 1997 Law on Flood Control could be revised to incorporate climate change adaptation priorities (OECD, forthcoming).

Table 4.5. **National laws that could more fully incorporate environmental priorities**

Law	Year
Circular Economy Promotion Law	2008
Flood Control Law	1997
Law on Prevention and Control of Air Pollution	1987, amended in 2000 and 2002
Law on Prevention and Control of Environmental Pollution by Solid Waste	1995, amended in 2004
Law on Prevention and Control of Water Pollution	1984, amended in 1996, implemented in 2000
Law on Promotion of Cleaner Production	1998, amended in 2003
Medium and Long Term Energy Conservation Plan	2004
Urban and Rural Planning Law	2008

Source: OECD (2007), *OECD Environmental Performance Review of China*, OECD Publishing, Paris; OECD (forthcoming), *Climate Change and Chinese Cities*, OECD Publishing, Paris.

Reflecting the Pearl River Delta's key contribution to China's energy demand and greenhouse gas emissions, the central government has crafted a plan to specifically address the region's environmental challenges within the "Outline of the Plan for the Reform and Development of the Pearl River Delta, 2008-2020". The plan addresses energy consumption, pollution and environmental degradation through the land-use policy reform, encouragement of energy efficiency, pollution controls, and open space preservation (Table 4.6) A key component of this section, the promotion of a "circular economy" aims to transform Guangdong's economy to one based on recycling, reusing and reducing the use of resources by encouraging efficient use of energy, water and other raw materials. To meet these policy priorities, the National Development and Reform Commission (NDRC) has set quantitative short-term and long-term targets. These include the target of reducing energy consumption per unit of GDP to 0.57 tons of standard coal equivalent (SCE) by 2020 and reusing 80% of industrial water

by 2020. The plan also aims by 2020 to achieve 15 square metres per capita of parks and green spaces in urban areas, 900 000 hectares of protected public forest, and 82 natural reserves. Urban wastewater treatment is projected by 2012 to reach 80% and 90% by 2020, and 100% compliance with industrial wastewater discharge requirements is expected by 2020 (NDRC, 2008).

Table 4.6. **Key features of the "Outline for the Pearl River Delta", environmental section**

Environmental section	Key Items
Efficient land use	• Explore land-use approval reform, to simplify the procedures and strengthen supervision
	• Experiment in establishing land compensation mechanisms, and use economic incentives to encourage efficient and intensive land use
	• Strictly enforce land-use plans and protect arable land
Develop circular economy	• Make efforts to conserve energy, water and other raw materials
	• Encourage comprehensive use of resources
	• Promote clean production
	• Develop a low-input, low-consumption, low-emission and high-efficiency economic model
Pollution prevention and control	• Focus on preventing pollution and enforcing comprehensive control
	• Reduce total amount of pollutants
	• Solve the significant problems that jeopardise human health and socio-economic development
Improve ecological and environmental protection	• Preserve sensitive ecological areas and ecosystem rehabilitation
	• Forest conservation for watershed protection and soil erosion prevention
	• Greenbelts, urban green spaces, and open space/farmland preservation

Source: NDRC (2008), The "Outline of the Plan for the Reform and Development of the Pearl River Delta 2008-2020", National Development and Reform Commission, China, *en.ndrc.gov.cn/policyrelease/P020090120342179907030.doc*.

Provincial and local action

Activity at the provincial and city level, particularly in Guangzhou and Shenzhen, has complemented and strengthened national efforts to address environmental priorities in the Pearl River Delta, particularly in the areas of renewable energy, energy conservation and transport energy reduction. Guangdong province incorporated energy conservation, pollution reduction and renewable energy into its major "Scientific and Technological Special" Programme for 2008, with a special fund of CNY 100 million. Guangdong also has plans to implement demonstration projects to disseminate energy conservation-based key technologies within the industries that feature intensive energy consumption and serious pollution (OECD, forthcoming). While the province has not yet started to draft plans dedicated to tackle climate change, the provincial Meteorological Bureau published the *Guangdong Climate Change Assessment Report* in 2007 (OECD, forthcoming).

Renewable energy development has become a key priority for energy-dependent cities such as Guangzhou and Shenzhen, but the severity of the region's energy shortages underscore the importance of fully implementing proposed plans. In 2009, Guangzhou became the first city in China to create a municipal-level plan for new and renewable energy, the New Energy and Renewable Energy Development Plan

2008-2020. The plan included a proposal mobilising investment of CNY 100 billion from both public and private sectors for the development of new energy sources[2] during the next 12 years, with the goal of increasing the city's share of new energy to reach 15% by 2020 (OECD, forthcoming). Complementing the national "Provisional Measures on the Administration of the Special Fund for Solar Photovoltaic Buildings" programme, the city of Shenzhen and Guangdong province plan to provide subsidies of CNY 20 per watt peak (Wp) to solar photovoltaic producers, which would almost fully subsidise the cost of production (OECD, forthcoming). To capture energy from waste, the Guangzhou Xingfeng Domestic Waste Landfill was launched in 2009 as a clean development mechanism (CDM) project under China's National 10th Five-Year Plan, and currently generates 50 Gwh of electricity annually, enough for 300 000 households (OECD, forthcoming). The CDM project is expected to bring CNY 50-100 million of income to Xingfeng Domestic Waste Landfill, with the payment arriving every quarter (Lai, 2009).

Local responses to energy priorities have also centred around energy conservation measures, which have had mixed success. In 2007, the Guangzhou Economic and Trade Commission launched the Top-100 Enterprises Energy Conservation Action, a local version of a national programme, which set local energy conservation targets for 150 energy-intensive enterprises that contributed 65% of Guangzhou's total industrial energy consumption (Box 4.3). Although the programme intended to tailor targets to each enterprise, in practice this proved difficult, and resulted in the establishment of similar objectives for all enterprises. Guangzhou's Development and Reform Commission has preferred energy-saving targets and economic incentives rather than mandatory regulations to reduce energy consumption, an approach that proved successful when subsidies totalling CNY 50 million were used to compensate the closure of highly inefficient cement-industry plants (OECD, forthcoming). The city of Zhuhai focused on residential energy demand, launching a Green Lighting Project in April 2009, allowing residents in pilot districts to purchase energy-saving lamps for CNY 1 or to exchange incandescent light bulbs for energy-saving ones. The city government prepared 300 000 energy-saving lamps, funded by CNY 2.3 million from a special fund for energy conservation (OECD, forthcoming; Deng, 2009).

Box 4.3. **Guangzhou's energy savings initiatives**

The city of Guangzhou aims to reduce energy intensity by 20%, in accordance with the targets of the 11th Five-Year Plan. Over 2006-2008, the city set itself apart from most provinces and cities in China by accomplishing over 60% of the full target and through several innovative energy efficiency programmes:

- The city launched the Top-100 Enterprises Energy Conservation Action, targeting the enterprises that together represented 65% of Guangzhou's industrial energy consumption.
- In 2008, the energy-saving project "10, 100, 1 000, 10 000" was initiated, with 10 standing for energy-saving demonstration projects in "10" major areas, 100 standing for the energy-saving technological transformation within "100" energy-intensive enterprises, 1 000 meaning a financial reward of CNY 20 million for energy conservation projects, and 10 000 for city enterprises to save 1 million tons of standard coal.

Source: OECD (forthcoming), *Climate Change and Chinese Cities*, OECD Publishing, Paris.

The energy efficiency of buildings has become a key priority for the city of Shenzhen, which in 2006 became the first city in China to release building energy efficiency regulations in its *Regulation of Building Energy Efficiency of Shenzhen Special Economic Zone*. These built on the city's 2003 *Design Code for Energy Efficiency of Residential Buildings* and exceeded the *11th Five-Year Plan of Building Energy Conservation* compulsory design standards of 50% energy conservation for all newly constructed buildings, and a stricter 65% standard in selected cities. The city's 2007 *Medium and Long-Term Energy Conservation Plan* set energy conservation targets for various sectors, including 20% for the lighting system, 25% for hotels, 15% for public and office buildings, 20% for government buildings, and 50% for newly constructed buildings. This was followed by the *Action Plan on Constructing a City of Green Buildings* in 2008. Building energy conservation goals represented 49% of Shenzhen's total energy conservation targets in 2008 (Table 4.7). Building energy conservation requirements are also a key feature of the city's Guangming eco-district (Box 4.4). At the end of 2008, the State Council acknowledged Shenzhen's leading role in building energy conservation in China (OECD, forthcoming).

Table 4.7. **Shenzhen's building energy conservation results and targets, 2006-2008**

Year	Manners	Results (energy saved or emission reduced)		
		Energy	Electricity	CO_2
2006-2007 (achieved)	Energy conservation standards for newly constructed buildings	515 000 tce	1.62 TWh	1.64 million tons
	Retrofit of existing buildings	82 000 tce		
	Application of renewable energy	20 000 tce		
2008 (goals)	Building energy conservation	408 000 tce	/	/
	Total energy conservation	825 000 tce	/	/

Source: OECD (forthcoming), *Climate Change and Chinese Cities*, OECD Publishing, Paris; Shenzhen Commission of Construction (2009), internal documents.

Implementation obstacles

The province of Guangdong and its cities, particularly Guangzhou and Shenzhen, as key national energy consumers and centres of energy-intense production, have also become key leaders in increasing energy efficiency, switching from fossil fuels to renewable energy, and developing new low-carbon technologies. However, more systematic, long-term efforts to improve environmental quality are needed. Energy and environmental targets in Guangdong are ambitious, and as such have faced a number of implementation obstacles. These stem from the three main means of policy implementation: *i)* including environmental quality in performance evaluation; *ii)* restricting the investment of high energy-consuming, polluting and low value-added industries, while encouraging investment in energy efficient and low-pollution industries; and *iii)* investing in pollution prevention and control facilities. Implementation challenges have arisen when environmental priorities are given lower importance in practice, when central government goals diverge from local or provincial priorities, and when municipal governments are unable to co-ordinate with each other or civil society on common challenges.

Box 4.4. **Shenzhen's Guangming eco-district**

In line with its plans to become a low-carbon city, Shenzhen has joined other Chinese cities in launching experimental low-carbon districts that promote energy efficient industrial practices and reductions in greenhouse gas emissions. The concept of a "special zone" is derived from the renowned experiment of special economic zones (SEZ) during China's economic reform. While SEZs were originally designed to encourage foreign investment by special preferential policies, they are being experimented with as a means for creating low carbon economic zones, which have not yet been officially established in China. Established in May 2007, the Guangming New Area consists of Guangming and Guangming sub-districts, with an area of 156.1 square kilometres and a population of 800 000. Located in the northwest of Shenzhen, the Guangming New Area is adjacent to Dongguan, an important industrial city in Pearl River Delta. The Guangming New Area has an abundant land reserve of 114.4 square kilometres of water area and unconstructed land, about 73% of its total area. In addition, currently more than half of the Guangming New Area is covered with green space. A standard of 65% energy efficiency has already been applied to newly constructed buildings. In 2007, the Guangming New Area was selected as China's first Green Building Demonstration District by the Ministry of Housing and Urban-Rural Development and the Shenzhen municipal government.

Source: OECD (forthcoming), *Climate Change and Chinese Cities*, OECD Publishing, Paris; Shenzhen Guangdong Government, "Guangming New Area Introduction", *www.szgm.gov.cn/main/xqgk/jbqk*, accessed 7 August 2009, in Chinese.

i) **Including environmental quality in performance evaluation.** Currently, evaluations of local and provincial leaders include environmental criteria and, as with other performance criteria, a local leader failing to meet the targets for three consecutive years is not to be eligible for promotion in the next five years. In practice, however, when higher level officials evaluate lower level officials, they are still likely to place more importance on their economic – rather than environmental – performance (Lo and Tang, 2006; OECD, 2007b). To broaden and sustain the impact of existing measures, energy and environmental targets need to be better aligned at the city, provincial and national levels, and lower level officials evaluated based as much on environmental criteria as well as economic performance.

ii) **Redirecting investment from energy inefficient industries to more efficient and less energy intense industries.** This disconnection in terms of intentions for performance reviews and actual implementation also poses vertical governance co-ordination challenges for the second implementation mechanism. For example, local authorities in Guangdong opposed a national plan to shut small, inefficient thermal power-generating units during the electricity shortages of 2006 and 2007 with the Guangzhou Economic and Trade Commission even providing funding to keep small power generators running. This put local energy priorities in direct conflict with national energy efficiency goals. While the global economic crisis of 2008-2009 relieved pressure by reducing energy demand, the potential for conflicts remains (OECD, forthcoming). Local resistance has also provided a barrier to efforts to reduce energy consumption. For example, while the Guangzhou Xingfeng Domestic Waste Landfill is an example of a successful CDM project, it has generated opposition from nearby residents, who argue the plant as operated emits more toxic gases than planned (OECD, forthcoming).

iii) **Investing in pollution prevention and control facilities.** The implementation of pollution reduction investments also poses horizontal co-ordination challenges. As municipalities are responsible for wastewater treatment, individual municipalities have little incentive to treat wastewater that will flow downstream to other municipalities. Incentives for inter-municipal co-ordination at the local level (e.g. grants for inter-municipal responses, or as a pre-requisite for infrastructure financing) is needed to improve responses to wastewater and other pollution problems that fall under each municipality's responsibility but affect others in the region. Policies to abate air pollution need to move beyond accords with industries to more stringent standards across the province, thereby preventing "pollution havens" in less well-regulated areas of the province.

As current implementation mechanisms focus on performance review and investment, the province and the cities of the PRD are in need of a systematic response to the energy, pollution and climate change adaptation challenges the region faces. For example, co-ordination is called for among cities in the PRD and with provincial authorities to effectively pursue strategies that lay the groundwork for future economic growth while decreasing the environmental impact of this growth and better connecting the workforce to future employment opportunities, such as connecting areas of new and existing urban growth through networks of mass transit as well as rail and road infrastructure, and orienting new development around mass transit infrastructure. While policies to increase mass transit and to innovate alternative fuels can help reduce transportation emissions, a more comprehensive approach is needed that concentrates on reducing the need for vehicle travel through density policies and imposing costs on vehicles during peak hours – both of which have been shown by OECD modelling not to harm local economic growth in the long term. Similarly, water management in the Pearl River Delta needs to be approached systematically, as wastewater discharges and industrial and agricultural pollution affect water quality and sources throughout the region. Finally, concrete measures are needed to prepare for and adapt to potential climate change impacts. While Shenzhen's monitoring system is an important early step, severe storm surge, rainfall and heat event scenarios need to be incorporated into infrastructure and urbanisation plans now to increase the long-term climate resilience of the built environment.

Additionally, stronger monitoring institutions are needed to measure progress on environmental targets. For example, although Guangdong's Energy Conservation Supervision Centre was set up in 2007, and municipal supervision centres have been established in several cities, Guangzhou has not yet built up its energy conservation monitoring institution (OECD, forthcoming). Environmental indicators need to be standardised to allow for comparison of the environmental impact of industrial activities across the cities of the PRD, as well as with Hong Kong, China.

Green growth and the Plan for a Green PRD

The challenge and opportunity for Guangdong and the cities of the PRD is to continue to grow economically while moving up the value chain and reducing air and water pollution and energy consumption. Green growth, or the promotion of industries and development strategies that have a positive impact on the environment, is a key means for increasing economic growth while improving environmental quality. Pursuing the dual goals of economic growth and environmental quality also presents an important opportunity to co-ordinate with Hong Kong, China to lower the

environmental impact of future growth across the Greater Pearl River Delta region (Greater PRD). Joint initiatives between Hong Kong, China and Guangdong have already begun, and this Plan for a Green PRD provides the foundation for future co-ordination on economic and environmental objectives for the region.

The environmental problems of the PRD and Hong Kong, China have been inter-related over the past decades. Hong Kong, China's restructuring since early 1980s has moved manufacturing activities to the PRD, which also has shifted the burden of environmental problems to Guangdong. Having boomed thanks to industries that relocated from Hong Kong, China, manufacturing sectors in the PRD have also caused serious air, and water pollution in the region. Effluents and emissions from the PRD increasingly affected Hong Kong, China in the 1990s. For instance, estimates are that the PRD accounts for 85%-99% air emission pollutants (e.g. SO_2, NO_x, PM10, VOC) in the whole Greater Pearl River Delta region in 2010 (Hong Kong Environmental Protection Department – HKEPD, 2007). A crucial source of the problem concerns the 56 000 Hong Kong, China-owned factories operated in the PRD, engaging in electronics, IT and communication; textiles, garments and footwear; plastic injection moulding; metal plating and processing; printing and packaging; and chemicals (Hong Kong Trade Development Council – HKTDC, 2008). Apart from factories involved in the electronics, IT and communication sector, other factories (considered as low value-added and polluting) are under pressure to invest in technology, so as to comply with increasingly stringent environmental requirements set by Guangdong government (HKTDC, 2008).

While co-efforts have started since the start of the decade, several obstacles have become evident during the process of co-operation on regional environmental problems. These obstacles are manifested in four aspects: *i)* regional environmental co-operation blueprints and ecological development plans appear to be lacking; such blueprints or plans could act as the foundation and vision for other sectoral policies; *ii)* current co-operation policy only focuses on "environmental protection" and the "production side", while neglecting the "green living" side. For instance, Guangdong and Hong Kong, China could not co-operate on recycling and the reuse of large quantities of household waste in Hong Kong, China because of China's policy to prohibit importing garbage; *iii)* difficulties exist in finding the balance between PRD cities and Hong Kong, China on environmental standards. Despite stringent environmental standards in Hong Kong, China, lower standards in PRD cities could exert a stronger influence on total pollution, given the predominance of pollutants from the PRD. Yet it is also unrealistic to expect environmental standards in Guangdong to meet standards in Hong Kong, China, since the PRD still expects rapid growth in its economy, population, electricity consumption and motor vehicle use; *iv)* lack of co-ordination on managing Hong Kong, China-owned polluting industries in the PRD; some industries with heavy investment from Hong Kong, China, e.g. the electroplating industry, are highly polluting yet crucial for the whole manufacturing supply chain. Restricting such industries because of their highly polluting profile could be harmful to the complete supply chain in Guangdong and Hong Kong, China (Bauhinia, 2008).

The recent emerging concept of transforming the Pearl River Delta area into a "green PRD quality living area" could have the potential to tackle the aforementioned problems. The objective is to develop the PRD region into a low-carbon, high-technology and low-pollution cluster of cities with a high quality of life. The concept was first suggested in March 2008 by Hong Kong, China Chief Executive Donald Tsang to the Guangdong party secretary-designate at the time, Wang Yang,

who formally endorsed it at the 11th Plenary of the Hong Kong, China-Guangdong Co-operation Joint Conference in 2008. Later, the concept was also adopted by the national "Outline for PRD" in 2008. Areas that could be explored for enhanced co-operation, according to the plan, include encouraging wider use of and research in renewable energy; facilitating joint efforts in natural conservation, promoting the development of a more circular economy; enhancing cleaner production in the region; and mapping out strategies to further improve the regional air quality. At the 12th Working Meeting of the Hong Kong, China-Guangdong Co-operation Joint Conference in January 2009, the 2 governments agreed to promote the concept of the Green PRD Living Area, and to strive for its inclusion in the National 12th Five-Year Plan (FYP). The inclusion in the 12th FYP could further elevate the concept as the blueprint for environmental strategy in the region.

Under the Green PRD Living Area vision, both sides would jointly draw up strategies to transform the PRD region into a green and quality living area under the principle of sustainable development, and seek to develop a more comprehensive and forward-looking approach to future regional environmental co-operation. The "Green PRD Quality Living Area" encompasses major collaborations that include (Yau, 2009):

- **Air quality improvement:** both Hong Kong, China and Guangdong will strive to derive a clean air accord for 2011-2020, which would specify new emission-reduction targets and measures for both sides. In particular, air quality requirements and emission standards are believed to become more stringent for the PRD region, as compared to the rest of China.
- **Recycling and reuse of reusable materials:** the focus is on working out a co-operation plan between Guangdong and Hong Kong, China, which could lay the framework for promoting recycling and reusing project collaboration in industries as well as service sectors. Moreover, it also calls for exploring mechanisms to collaborate on reusing household garbage.
- **Green transportation:** efforts have been put in place to promote clean-fuel vehicles in the region. For instance, Hong Kong, China has been engaging different car manufacturers in Hong Kong, China to push for electric vehicles, partnering with Shenzhen carmaker, BYD Auto. This has received government support from the Environmental Bureaus of Hong Kong, China and Shenzhen.
- **Cleaner production:** a co-operation project started in 2008 aims to encourage and facilitate Hong Kong, China-owned factories in the PRD to adopt cleaner production technologies and practices. The Hong Kong, China government matches funds spent on cleaner production on a 1:1 basis. By the end of 2009, the project had attracted over 400 firms to join. Moreover, the government of Guangdong is considering adopting a similar approach in order to increase the scale and coverage of the project.
- **Green business development:** policy guidance by Guangdong and Hong Kong, China related to green sectors could call for measures to increase business opportunities in the region, e.g. cleaner production, investment in green infrastructure (building), renewable energy, environmental consultancies/ services, etc.

The institutional arrangement of Hong Kong, China and Guangdong falls under the umbrella of the Hong Kong, China-Guangdong Joint Co-operation Commission, co-chaired by Hong Kong, China Chief Executive Donald Tsang and Guangdong Party Secretary Wang Yang. Under this umbrella, different policy bureaus have developed their own working groups. A Joint Working Group on Sustainable Development and Environmental Protection has been set up by Environmental Bureau of Hong Kong, China and the Environmental Protection Department of Guangdong. One notable example of collaboration concerns the consensus reached in 2002 by both sides on emissions reductions of 4 major air pollutants by 2010, using 1997 as the base year: sulphur dioxide (SO_2) by 40%; nitrogen oxides (NO_x) by 20%; respirable suspended particulates (RSP) by 55%; and volatile organic compounds (VOC) by 55% (HKEPD, 2009). It is believed that the recently signed "Framework Agreement on Hong Kong, China/Guangdong Co-operation" (FAHGC) in 2010 could strengthen the institutional foundation for further collaboration in the Greater Pearl River Delta (see Section 5.2).

Notes

1. Chreod calculations based on Nicholls, R. *et al.* (2008) "Ranking Port Cities with High Exposure and Vulnerability to Climate Extremes," *OECD Environment Working Papers*, No. 1, OECD Publishing, Paris.
2. New energy indicates nuclear energy and renewable energy sources (solar energy, geothermal energy, wind energy, ocean energy, biomass energy, etc.).

Chapter 5

Governance in Guangdong

Previous chapters have underlined the importance of developing regional innovation systems, and improving regional planning, transportation and environmental management. Governance mechanisms are essential for the provision of these goods and services: they require intergovernmental co-ordination as they have spillovers, planning in order to direct market developments and funding to be able to provide them. The first section provides an overview of the main institutions in Guangdong and their responsibilities. In order to make a strong transition to a high value-added economy, Guangdong will have to find a new balance between inter-city competition and co-operation, as is argued in the second section, with more attention to stimulating co-operation mechanisms, including cross-border co-operation. The effectiveness of planning, assessed in the third section, is currently constrained by the limited extent to which it reflects market developments, weak co-ordination between levels of governments and monitoring mechanisms that could be improved.

Introduction

Governance is essential to solve Guangdong's main challenges of upgrading the economy and dealing with regional disparities. This features as a priority in both the Provincial 11th Five-Year Plan and the "Outline for PRD". As mentioned previously, Guangdong's dramatic industrialisation and urbanisation over the past 30 years has subverted the delineation of administrative boundaries (and hence, hierarchies of governance). In the PRD, some of the infrastructure was built rapidly in the absence of an integrated development strategy, which might have resulting in diseconomies of scale in duplicated facilities, uncontrolled suburban development. Previous chapters have underlined the importance of developing regional innovation systems, and improving regional planning, transportation and environmental management. Governance mechanisms are essential for the provision of these goods and services: they require intergovernmental co-ordination as they have spillovers, planning in order to direct market developments and funding to be able to provide them. The first section provides an overview of the main institutions in Guangdong and their responsibilities. In order to make a strong transition to a high value-added economy, Guangdong will have to find a new balance between inter-city competition and co-operation, as is argued in the second section, with more attention to stimulating co-operation mechanisms, including cross-border co-operation. The effectiveness of planning, assessed in the third section, is currently constrained by the limited extent to which it reflects market developments, weak co-ordination between levels of governments and monitoring mechanisms that could be improved. Another important governance tool for sub-national governments is finance: public expenditures in Guangdong could be more focused on items that help achieve its goal to move towards a high value-added economy (education, innovation and R&D), whereas fiscal revenue sources could be designed so that they provide incentives for environmental sustainability and fiscal equalisation mechanisms could be put in place that further reduce regional inequities with Guangdong.

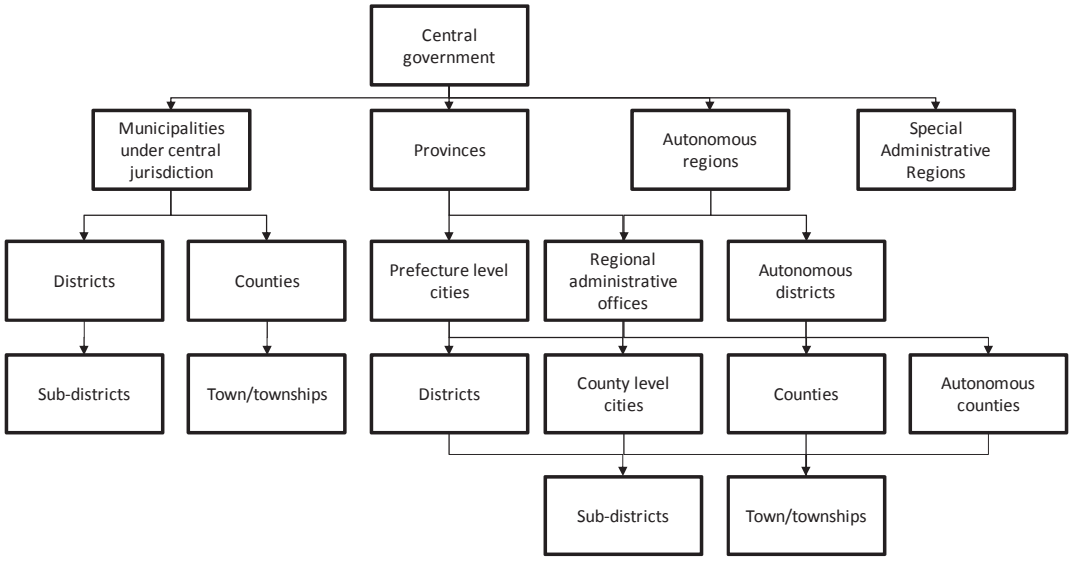
5.1. Institutions and their responsibilities

Main sub-national actors in China

China has been a unitary centralised state since 1949, with 4 sub-national levels of government. These include the provinces, the prefecture-level city administrative level, the county level and the town, township and sub-district level administrative unit. These four sub-national government tiers exist in many different forms (Figure 5.1). For example, the provincial-level administrative unit includes provinces, autonomous regions, municipalities and special administrative regions directly under the jurisdiction of the central government, mainly with the functions of regional management. Many cities, however, have governments at the prefecture-level or county level, which makes it complicated to effectively achieve regional co-ordination. The legislative branch – the People's Congress – is mirroring the structures of the executive branch of the Chinese state. People's congresses exist at the national, provincial, city, district and county levels and operate under the close guidance of local Party committees. At the city level, people's congresses and their standing committees are responsible for key decision making on local issues (including budgets) as well as

for the appointment and removal of key executives, including the mayor and vice-mayors.

Figure 5.1. **Structure of government in China**



Source: OECD based on Zhang and Wu (2006).

Higher government tiers in China have various instruments to control lower level governments. Such control is achieved through four means. First, through administrative orders: these are decisions and commands in which power is transferred or withdrawn. Peoples' congresses have the right to repeal legislation, regulations and directives made by the next lowest level that are found to be inconsistent with higher level decisions. The second instrument is the mandatory plan: the higher level government delegates various plans of social and economic development to lower level ones, which are required to implement them. These plans can set targets on indicators such as GDP and FDI. A third instrument is resource and financial allocation: higher level government intervenes in the development of lower levels through means such as quotas of construction land, establishment of investment plans and adjustment of financial allocation. A final instrument is personnel appointments and removals: as the administrative head of a lower level of government is appointed by the higher level government, lower level government necessarily considers the intentions of higher level government to a certain degree (Zhang and Wu, 2006).

Relations between these different levels of government in China are largely structured along sectoral lines. There is almost a complete replication of functional organisations from the central to provincial governments, and then to the municipal level: central ministries have their counterparts at the provincial level which are mirrored in the municipality (e.g. municipal finance bureaus report to provincial finance bureaus which in turn report to the Ministry of Finance). While these organisations are expected to respond to direction from senior government executives at their level, they are also required to comply with the decisions of their administrative counterpart at the next higher level. Despite this stepped authority, the Constitution provides that all levels of administration are subordinated to the central State Council.

The establishment of new district, county and municipal governments can only occur with the approval of the central State Council.

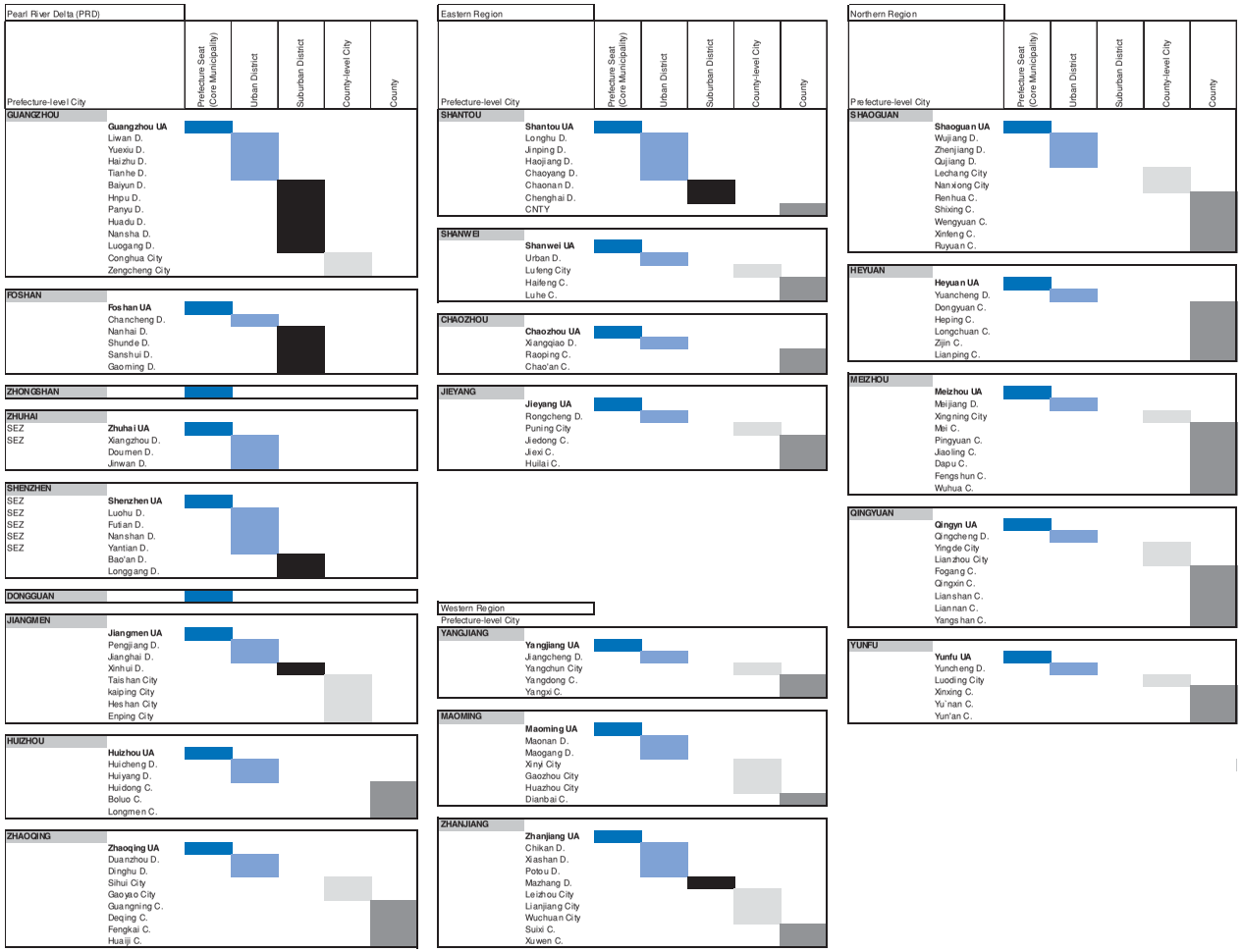
Governance in Guangdong is characterised by institutional diversity and complex interrelations. The Pearl River Delta region contains nine prefecture-level cities, of which Guangzhou and Shenzhen have acquired the status of sub-provincial,[1] while the remaining seven are regular prefecture-level cities. Shenzhen and Zhuhai contain special economic zones (SEZs) in their prefecture territories. In addition, there are nine county-level cities and two counties. The prefecture-level cities, county-level cities and counties are all under the jurisdiction of the Guangdong provincial government. There are also 32 urban districts ranked at the same level as county-level cities and counties. Several urban districts were transformed from former county-level cities, including Huadu and Panyu (under the jurisdiction of Guangzhou) and Nanhai, Shunde, Sanshui and Gaoming (under Foshan). In 2008, there were 21 prefecture-level cities, 23 county-level cities, 44 counties, and 54 urban and suburban districts (Figure 5.2).

Public participation in urban management in China is still at an initial stage, which is characterised by informing the public rather than collecting opinions for improving urban development policy making (Wong *et al.*, 2006). Little progress has been made in encouraging the active participation of groups such as women, young people, indigenous people and other local communities, although the evolution of the Guangzhou Agenda 21 has led to a relatively liberal degree of public discussion (Seabrooke *et al.*, 2004). The lack of public participation in policy making has led to increasing difficulties in the implementation of some policies. Some programmes in the Guangzhou Development District, such as a programme for the resettlement of villagers affected by land acquisition was not welcomed by the affected villagers because villagers preferred low-rise houses rather than high-rise apartments (Wong *et al.*, 2006). Co-operation between the public and private sectors was confined only to project-oriented *ad hoc* agreements between government and business interests.

Allocation of responsibilities

The responsibilities of sub-national government levels in China are not precisely defined and can differ according to province. China's "Law of the Local People' Congresses and Local People's Governments" was enacted in 1979 and last revised in 1986: it does not define precise functional responsibilities that municipal governments are expected to exercise. Therefore, delegation is by administrative fiat from the central and provincial executives. Generally speaking, city functions tend to include urban planning, tertiary education, veterans' assistance, infrastructure construction, market regulations, etc. By and large, district responsibilities are limited to the operation of enterprises owned by district governments and their undertaking units. Street cleaning and solid waste collection, maintenance of local parks, land leasing (where allowed), limited primary health care through clinics, and some localised social welfare services are exercised at the municipal level.

Figure 5.2. **Detailed administrative structure of Guangdong province, 2008**



Source: GDPG (2009), "Background Report of Guangdong", internal background report submitted to the OECD, Guangdong Development and Reform Commission, 29 April 2009, in Chinese.

Since the 1990s, the central government has devolved authority to lower local levels of government. Among the responsibilities that were transferred were fixed asset investments (e.g. infrastructure, transport and manufacturing), business and tax policies and control over around three-quarters of the state industrial firms. As each of the layers of the administrative hierarchy has considerable regulatory power, China has in effect a shared governance structure that requires continuous negotiations among different levels of government.

Thanks to the bottom-up development path in the PRD, Guangdong is characterised by a relatively strong position of cities and local (town and village) governments. The policy aimed at attracting foreign investment has equipped cities and towns with their own capacities to mobilise resources to enhance local development. Cities have devolved administrative responsibilities to town governments – including foreign trade, fixed assets investment, commercial administration, labour and personnel management, etc. The PRD's bottom-up development process has therefore embodied the most radical political and economic decentralisation process in China. After two decades of development, villages and towns have established strong autonomous powers, and more importantly, formed their own local interest structure (Po, 2007).

China has undergone two major fiscal decentralisation reforms over the last two decades. The first reform started in 1985 and became known as the Fiscal Contracting System (FCS), and the second reform started in 1994 and was termed as Tax Sharing System (TSS). The essence of the FCS was a contracting system whereby the central government allowed provincial governments to retain part of the tax revenues remaining after the remittance of a fixed sum to the central government for a certain period of time. This created problems for the central government as it gave local governments incentives to provide resources to local enterprises, such as tax exemptions, at the cost of central government revenues. Extra-budgetary funds provided a way to shield tax collections from central governments and became a safety valve allowing sub-national governments to provide basic service levels. Realising the shortcomings of the FCS, the central government adopted the TSS in 1994, with the aim to increase the shares of government revenues in GDP and to increase the share of central government revenue in the total budgetary revenue (Qiao *et al.*, 2008).

As a result, China could now be considered one of the most fiscally decentralised countries in the world, although sub-national governments are highly regulated by the central government. Its sub-national expenditure accounts for approximately 60% of total government expenditure, versus a 34% average for industrialised economies, and a 22% average for developing countries. China is, however, less decentralised than what appears on the surface. There are several binding expenditure laws and expenditure mandates. Sub-national governments are largely dependent on shares of central taxes and grants and local fiscal dependence, combined with a hierarchical party structure and the absence of national elections, has in some cases led to what has been described as the predatory behaviour of the upper-level governments (Shen *et al.*, 2006). The higher level government has the discretion to determine the expenditure assignment of the level immediately below it: provinces determine the assignment of cities/prefectures, the cities determine the assignments of counties and the latter determine assignments of townships. Central regulation also translates itself in sub-national human resource management: regional and local cadres are managed by the top through the Target Responsibility System.

Fiscal decentralisation has been conducive to regional economic development, but also allowed for larger regional disparities between and within provinces in China. The fiscal decentralisation reforms have considerably strengthened the fiscal incentives of provincial governments in China, and they are generally conducive to provincial economic development and reform. These fiscal incentives are here defined as rewards for local government policy in the form of an increased local revenue base: it is thus critical whether the local government is able to keep a significant portion of the increased tax revenue that results from their policy decisions. If so, they have strong fiscal incentives to support market development. Strong fiscal incentives for local governments in China have been shown to be associated with healthier local business development, while those with low fiscal incentives are associated with the opposite effect (Jin *et al.*, 2005). Although fiscal decentralisation has been shown to lead to higher growth rates in China, there might, however, have been a trade-off between economic growth and equity, as inequality in the distribution of fiscal resources across local governments has simultaneously increased significantly over the period of the main fiscal decentralisation reforms (1985-1998) (Qiao *et al.*, 2008). The existence and use of extra-budgetary funds has, however, contributed to the alleviation of disparities in the distribution of fiscal resources: sub-national authorities that were more constrained in their fiscal resources have used these extra-budgetary funds as a solution for their fiscal stress.

5.2. Main governance challenges

Finding the balance between intra-regional competition and co-ordination within the PRD

As a key element in the transition of the Chinese economy, competition between local governments has been fuelled by decentralisation and has provided many learning opportunities. The introduction of SEZs, Open Coastal Cities as well as the flourishing number of development zones have not only stimulated the vibrant investment attraction dynamics (see Section 3.1), but also intensified local government competition. Most local governments in Guangdong perceive investment attraction, in particular FDI attraction, as a crucial source of economic growth, and hence compete with their neighbouring jurisdictions for the investment. Cross-regional competition increased after decentralisation induced the privatisation of state-owned companies by sub-national authorities, despite the lack of private ownership regulations (Li *et al*., 2000). After fiscal reforms in 1994, local governments became more dependent on revenues produced by their own enterprises: to increase revenue, the efficiency of their companies had to be improved and for that purpose had to be privatised. Competition between cities has had positive effects in terms of institutional experimentation and learning. Inter-city competition in the area appears to have stimulated capacity building from experimental learning approaches.

Competition between cities, however, has led to the duplication of infrastructure, some of which has been absorbed by high growth rates, but some of which could be considered wasteful. Inter-city competition has sometimes in the literature been criticised for its negative effects, such as the risk of duplication of infrastructure, which leads to redundancy and waste of capital. This negative effect has, however, not been effective in Guangdong as most of what might have been considered excessive infrastructure appears now to be appropriate to meet the demands of continuing rapid

economic development in the years to come. Yet, the competition within the Pearl River Delta seems to have led to over-provision of major infrastructural facilities. For instance, there are five international airports serving the region: Hong Kong, China, Macao, China, Zhuhai, Guangzhou and Shenzhen. There are also a similar number of container ports all vying for the trade offered in South China. This has led to inefficient use of resources and capacity: e.g. Zhuhai airport has a maximum planned capacity of 12 million passengers, yet in 1998 and 1999 it handled only 71 320 and 57 850 passengers respectively (Bruton *et al.*, 2005).

The lack of regional co-ordination within the PRD has also constrained the flow of goods and services within the area. For instance, until very recently, the municipalities of Guangzhou and Foshan had very weak co-ordination in the planning of roads, infrastructure, and compatible land uses. Disconnected planning of expressways and major arterial roads has led to roads that occasionally do not connect and, if they do, end up being regulated differently because they are classified differently. Similarly, land-use planning has been conducted independently, which has led to incompatibility in zoning along the municipal border: some lands are inappropriately serviced by roads from the other municipality. To date, there has been no shared delivery of public infrastructure services, leading to the inefficient duplication of water supply, wastewater, and solid waste management infrastructure facilities, and unnecessarily high recurrent costs for their operations and maintenance. Aside from infrastructure, regulatory constraints inhibit the free flow of goods and services between the two municipalities. In particular, separate business licensing processes often preclude – or at least severely constrain – the ability of firms to operate in both cities. For example, a trucking firm in Foshan can deliver to a client in Guangzhou, but it is not licensed to pick up and transport from Guangzhou back to Foshan. The principal reason for inter-municipal trade barriers is that business and VAT taxes are attributable to the municipality in which a firm is registered. Currently, there is no way for Guangzhou to charge taxes on business activity in Guangzhou conducted by a firm from Foshan (and vice versa).

Guangdong is entering a phase of economic development where regional co-ordination might become more important. After China's accession to the WTO, SEZs and Open Coastal Cities have lost their special preferential status to overseas investors in terms of promotion of industrialisation and inward investment. More value added could be created by combining and linking different parts of a regional economy and creating synergies. There is potential for such synergies, as several different neighbouring urban cores are relatively unlinked and un-co-ordinated, and if they were combined and co-ordinated they could be stronger in facing world-wide competitors. Such synergies might exist in strongly represented sectors in the Pearl River Delta, such as manufacturing, finance and logistics.

Regional co-ordination is complicated because local interests differ, e.g. with regards to the development of the different ports in the region. Unlike in the YRD where all container port operations are co-ordinated by a single entity (Shanghai Port Range Management Committee),[2] there is no overall co-ordinating entity for port development in the Greater Pearl River Delta, resulting in a cluster of competing facilities. Moreover, two major ports in the YRD – the Shanghai Port and Ningbo Port – have recently started initiatives to improve their co-operation by setting up a joint venture. In contrast, both Hong Kong, China and Shenzhen, endowed with very large ports, claim to be the major global trade hub to South China. This leads to conflicts of interest with regards to the future development of these ports. Although a

matured, nearly fully utilised terminal in Hong Kong, China yields a higher margin of profit than a newly built terminal in Shenzhen, a new terminal in Hong Kong, China would cost more to run than a comparable terminal in Shenzhen. The strategy then becomes obvious: keep using current terminals in Hong Kong, China as much as possible, while developing new terminals in the mainland to handle future growth. Clearly, this strategy is at variance with the wishes of the Hong Kong, China government. In this situation of port competition between Hong Kong, China and Shenzhen, the position of the Chinese Ministry of Communications, responsible for the planning and operation of major Chinese ports, is not clear. Some authors suggest there was an unstated commitment of the central government to help Hong Kong, China pass through the difficult times around 2000 (Wang and Slack, 2000). Existing cross-border plans do not focus on securing win-win co-operation of both ports.

In some of these cases, market developments have shaped new functional regional realities in the absence of regional co-ordination, for example in the formation of a South Chinese regional container port system. The governments of Shenzhen and Hong Kong, China may have conflicting interests on regional port systems, but major port operators have already acted from a regional perspective, in rationalising the hinterland share for their terminals in Hong Kong, China and emphasising the growth in Shenzhen (Wang and Slack, 2000).

In other fields such as transport infrastructure, regional initiatives have recently been put in place. In July 2008, the government of Guangdong announced its plan to launch massive infrastructure developments (a stimulus package, named as "New Ten Projects", see Section 3.2). Among the investments proposed was the expansion of the high-speed intercity railway network planned in 2004 to link core cities in the PRD to reduce travelling time between cities to within an hour, forming the so-called "one-hour living sphere" by 2020. The first phase of a metro line between Guangzhou and Foshan will be operational in 2010. This underground line will be seamlessly connected to Guangzhou's metro network, with eight planned interchange nodes (CB Richard Ellis – CBRE, 2008). This metro line fits in a wider agreement between Guangzhou and Foshan for co-operation (Box 5.1). Although this agreement appears to have resulted from pressures from the provincial and central governments to respond to the State Council's "Outline for PRD", it is the first inter-municipal co-operation agreement in China and has the potential for addressing many of the constraints that currently undermine agglomeration benefits from accruing across the functional metropolitan region.

There is, however, a history of regional co-ordination efforts with little concrete results so far. These diversified administrative jurisdictions and multiple institutions may have complicated regional planning. Several initiatives for the long-term development of the Pearl River Delta have proven ineffective. In the mid-1990s the Guangdong provincial government set up a committee to plan the socio-economic development of the PRD Economic Region, but with little results. Another group was formed to co-ordinate development of the PRD Economic Region in 2002, with a similar lack of results (Yang, 2006).

Box 5.1. **Guangzhou and Foshan sign the "Agreement of Integration Co-operation Framework"**

On 19 March 2009, the Municipality of Guangzhou and Foshan signed the "Co-operation Agreement of Guangzhou-Foshan Integration". The directors of four sectoral leading groups for sectoral integration of urban planning, transport infrastructure investment, industry co-operation and environmental protection also signed the sectoral integration agreements.

In January 2009, the State Council approved the "Outline of the Plan for the Reform and Development of the Pearl River Delta Region". This "Outline for PRD" explicitly calls for promoting the integration of Guangzhou and Foshan, and encourages the integrated Guangzhou-Foshan to lead the process of building the PRD into an urban cluster with a rational layout, sound functions and good connections. In March 2009, Guangzhou and Foshan agreed to set up the leading institution and co-ordination mechanism for Guangzhou-Foshan integration, based on which, the "Guangzhou Foshan Mayors Round Table" was later established.

The Party Secretary of Guangzhou, Mr. Zhu Xiaodan, stated that the breakthrough for the implementation of the new "Outline for PRD" is the integration of PRD, and the breakthrough of PRD integration will be the integration of Guangzhou and Foshan. The Party Secretary of Foshan, Mr. Lin Yuanhe, stated that the key to Guangzhou-Foshan integration is to optimise resources distribution through regional co-operation. The two cities will co-operate, and compete too. The economies of Guangzhou and Foshan actually demonstrate high potential for complementarities. In 2008, the total GDP of the 2 cities reached CNY 1.25 trillion.

Source: Xinhua News, *http://news.xinhuanet.com/newscenter/2009-03/19/content_11037051.htm.*

These regional initiatives are likely to fail if incentive structures to engage in intergovernmental co-operation are not adjusted. Local officials have incentives to promote local economic interests, rather than regional interests including sustainability. The Chinese administrative system uses performance criteria to evaluate local officials. However, most of these criteria attach priority to economic growth rather than sustainable development. Local politicians have endeavoured to produce tangible results in their own jurisdiction in order to impress national leaders of their capability. This, however, relegates regional co-ordination to a secondary role, resulting in what has been described as unreasonable competition and duplication. Although reforms have been announced (in which energy conservation becomes an element of the performance assessment of local officials), they will have to be implemented coherently in order for them to have an effect on regional co-ordination. Any regional plan that calls for multi-dimensional integration will be difficult as local authorities focus more on competition than co-operation.

In order to increase inter-city co-operation, a platform organisation with the largest cities in the PRD could be created. Such a platform might follow the example of governance arrangements for metropolitan Tokyo, which has around 34 million inhabitants. For this area, there is an informal co-operation platform called the capital Region Summit (or "Eight Prefectures and Metropolitan Cities Summit") established in 1979, which searches for horizontal co-operation on themes like environment, waste and disaster management. Another model, less informal, is to increase horizontal co-ordination through co-operation in certain functions, such as marketing and investment promotion. An example of this is the service organisation Invest Thames Gateway, launched by 3 English regional development agencies (SEEDA, EEDA

and LDA) in 2008. This organisation will be responsible for attracting inward investment to the Thames Gateway and work together to provide a seamless customer service. This is done on the basis of a jointly produced Thames Gateway Economic Development Investment Plan.

In addition, more incentives could be introduced to increase horizontal co-ordination in the region. In some other OECD member countries, such as France, the national government provides grants that are conditional on the co-operation of local governments amongst themselves. One-third of the regional development budget is reserved for projects that are cross-cantonal, e.g. for projects in which regional governments co-operate with each other. Similar mechanisms might be considered in Guangdong province.

Creating more linkages between urban and rural areas

Urbanisation in Guangdong offers economic opportunities to its rural areas, as they can adapt to an increasing urban demand for goods and services from rural areas. Culture, landscapes and biodiversity are but a few of the assets Chinese rural areas can offer to urban citizens in a closer rural-urban relationship. There are many possibilities for rural-urban linkages in terms of business clusters, cross-border tourism initiatives, local food chains and better integrated transport and other services' networks. As migration dynamics in many other countries have shown, substantial opportunities will arise as congestion in cities increases and as diseconomies of agglomeration will provide incentives for people and businesses to relocate or commute from rural areas.

Rural tourism and energy provision hold great promise. According to statistics, rural tourism served more than 400 million tourists in 2007 and earned over CNY 3 000 billion of which CNY 1 200 billion directly benefited farmers. The perspectives are positive: Chinese per capita leisure time and habits are evolving and, according to several forecasts, China could become the first tourist destination and the fourth source of tourists by 2015. Also, the development potential of renewable energy production still seems to be largely unexploited despite the fact that cleaner energy is promoted by the central government. This approach offers considerable opportunities for the development of rural areas. Methane from biomass is particularly promoted, offering an alternative for villages which are not connected to the electricity grid. Wind power, hydro power and thermal solar energy are other promising renewable energy sources and often located in low income areas.

Similarly, Chinese rural areas have great potential in the growing market of certified high value-added typical food, agricultural and forest products for both exports and domestic consumption. Natural and cultural resources are often abundant in lagging rural areas. A lot has been done in recent years to support development in these sectors and many policy experiments are ongoing to better exploit rural-urban linkages. However, current policies would benefit from stronger government investment towards rural economic diversification and the extension of existing specified standards such as organic and fair trade. In terms of policy co-ordination, for example, the many existing tourism development initiatives could be further integrated with typical food production programmes through territorial marketing policies and as part of integrated local development strategies. In this framework, the key to diversification is not individual policies targeting one specific sector but rather the capacity to provide the right mix of framework conditions that allow new economic activity to flourish (OECD, 2009f).

Reaping synergies from cross-border co-operation

Since the mid-1990s, overwhelming inflows of manufacturing investments from Hong Kong, China to the PRD were followed by an ever-increasing cross-boundary movement of population, goods and activities such as working, shopping and taking up residence. There is an uptake of cross-border flows of persons and more and more people use the Hong Kong, China-Shenzhen area as one functional area. As a result, a cross-boundary region between the PRD and Hong Kong, China has emerged as an integral entity.

However, further integration is constrained by a variety of factors. The existence of the boundary between Hong Kong, China and the PRD has induced restricted linkages between Hong Kong, China as an economic city centre and its hinterland. Cross-boundary flows of population are asymmetric: in contrast to the free flow from Hong Kong, China to the PRD and mainland China, reverse flow is restricted in number by regulation. Frequent congestion and restricted operational hours at the boundary crossings between the PRD and Hong Kong, China has to some extent reduced the extent of regional economic integration. The flow of capital between Hong Kong, China and the mainland is constrained by differences in financial regulations and a non-fully convertible RMB (in combination with fully convertible Hong Kong dollars). With regards to the flow of goods, further improvements could be made in customs on aspects such as inspection standards, the speed and efficiency of customs clearance, and the transparency of customs operations. Differences in legal systems have constrained the co-operation and integration of services industries such as law, accounting and logistics (Bauhinia Foundation Research Centre – BFRC, 2007). A common regional identity is lacking, and duplication and wasteful competition appears to have taken place.

Differences in government structure have further complicated cross-border co-operation between Hong Kong, China and Guangdong. Relations with Hong Kong, China are subject to the One Country Two Systems (OCTS)-framework. Under this framework, the planning and development of the PRD and Hong Kong, China have been separated from each other. In addition, communication between Hong Kong, China and the various local governments of the mainland should get the approval from the different relevant departments of the central government, such as the State Council Office of Hong Kong and Macao Affairs. According to the "Basic Law", the boundary between the PRD and Hong Kong, China is supposed to remain unchanged for 50 years (from 1997). Yet, closer integration would require a more permeable boundary.

There are indications that further integration between Hong Kong, China and Guangdong (to start with Shenzhen) could have a large positive impact. Different studies have shown positive impacts of the economic integration of Hong Kong, China with mainland China. Tao Tao (2005, as citied in BFRC, 2007) found that Hong Kong, China's direct investments have been the major driver of economic growth of the Guangdong province, contributing to two-thirds of Guangdong's economic growth, with each percentage point of growth in Hong Kong, China's direct investments leading to 0.15% economic growth for Guangdong. Chen Xiuzhen (2005, as citied in BFRC, 2007) found that for every 1% increase in the degree of economic integration between Hong Kong, China and the mainland, the total output per capita rose by 0.31% in Hong Kong, China, 0.39% in mainland China, 0.73% in Guangdong province and 0.87% in Shenzhen. In another study, the impact of an

integrated Hong Kong, China-Shenzhen metropolis would have a positive impact on the GDP of Hong Kong, China (with a rise of GDP by 0.67 % point at its peak in 2017) and Shenzhen (0.61% point increase in 2017) (BFRC, 2007).

Whilst most collaboration between Guangdong and Hong Kong, China has been issue- or project-based, (infrastructure, economic development, infectious disease control and surveillance) several co-operation mechanisms have been set up, including infrastructural projects and economic development. A formal communication mechanism, the Guangdong-Hong Kong, China Co-operation Joint Conference was set up between the Hong Kong, China government and the Guangdong provincial government in 1998. The establishment of an institutional integration based on the Closer Economic Partnership Arrangement (CEPA) signed between the central government and the Hong Kong, China government in 2003 has given further impetus to regional integration between the PRD and Hong Kong, China (Box 5.2). On sustainability-related issues, an environmental working group was set up between Guangdong and Hong Kong, China that has government officials as representatives from both sides (see Section 4.3). In 2008, Hong Kong, China and Shenzhen explicitly spelled out their intention to bring the two cities closer together in terms of their urban planning, creating a more favourable cross-border business environment. Significant improvements have been made in the area of transport infrastructure. The two cities have two border crossings which are directly accessible via the metro networks of both cities. The Western Corridor, completed in 2007, was the first long-span bridge connecting the western part of Hong Kong, China to Shenzhen.

The impetus following recent initiatives, such as proposals for a close co-operation zone and the recent framework agreement for co-operation between Hong Kong, China and Guangdong could be used to stimulate economic integration. In June 2008, the Guangdong Provincial Committee of the Chinese Communist Party and the Guangdong Provincial People's Government proposed to establish a "Guangdong-Hong Kong, China-Macao, China Close Co-operation Zone". The proposal was positively received in Hong Kong, China and Macao, China. A key to establishing the Guangdong-Hong Kong, China-Macao, China Close Co-operation Zone is to give Guangdong the right to be the first to implement the new CEPA initiatives. Guangdong could take the lead to establish a Pearl River Delta sub-regional co-operation mechanism. It might also suitably modify its related policies according to the implementation needs of CEPA. The opportunity can be taken to improve its economic and administrative governance with the benefit of CEPA. Meanwhile, it should ensure that its head-start actions provide good examples for other regions to follow. The requirement for deepening cross-border co-operation has put forward a new co-operation agreement – "Framework Agreement on Hong Kong, China/Guangdong Co-operation" (FAHGC) in 2010. The FAHGC sets clear targets and development positioning for Hong Kong, China-Guangdong co-operation, including: promoting joint economic development and environmental co-operation in Hong Kong, China and Guangdong to create a new world-class economic zone (Box 5.3).

Box 5.2. **Mainland and Hong Kong, China, Closer Economic Partnership Arrangement (CEPA)**

The Mainland and Hong Kong, China Closer Economic Partnership Arrangement (CEPA) is the first free-trade agreement ever concluded by the mainland of China and Hong Kong, China. The main text of CEPA was signed on 29 June 2003.

CEPA opens up huge markets for Hong Kong, China goods and services, greatly enhancing the already close economic co-operation and integration between the mainland and Hong Kong, China.

CEPA adopts a building block approach, and the two sides have been working closely to continually introduce further liberalisation measures. The agreed liberalisation measures for various phases of CEPA are stipulated in the CEPA Legal Text.

CEPA is a win-win agreement, bringing new business opportunities to the mainland, Hong Kong, China and all foreign investors. For Hong Kong, China, CEPA provides a window of opportunity for Hong Kong, China's businesses to gain greater access to the mainland market. CEPA also benefits the mainland as Hong Kong, China serves as a perfect "springboard" for mainland enterprises to reach out to the global market and accelerating the mainland's full integration with the world economy. Foreign investors are also welcome to establish businesses in Hong Kong, China to leverage on the CEPA benefits and join hands in tapping the vast opportunities of the mainland market.

In terms of implementation, CEPA covers three broad areas:

- Trade in goods – all goods of Hong Kong, China origin imported to the mainland enjoy tariff-free treatment, upon applications by local manufacturers and if the CEPA rules of origin (ROOs) are agreed and met.
- Trade in services – Hong Kong, China service suppliers enjoy preferential treatment in entering into the mainland market in various service areas. Professional bodies of Hong Kong, China and the regulatory authorities in the mainland have also signed a number of agreements or arrangements regarding mutual recognition of professional qualification.
- Trade and investment facilitation – both sides agreed to enhance co-operation in various trade and investment facilitation areas to improve the overall business environment.

Source: Trade and Industrial Department, Hong Kong SAR Government, *www.tid.gov.hk/eindex.html*.

Box 5.3. Framework Agreement on Hong Kong, China/Guangdong Co-operation

The Framework Agreement on Hong Kong, China/Guangdong Co-operation" (FAHGC), agreed on in 2010, initiates specific policies and measures around the following key items:

- **Modern services:** to promote financial services, measures include exploring specific arrangements for bank financing and issuance of RMB bonds in Hong Kong, China by Guangdong enterprises, advancing the RMB cross-border trade-settlement pilot scheme, and encouraging more Guangdong enterprises to list in Hong Kong, China. To support the manufacturing and services sectors, the two places will help Hong Kong, China-owned processing enterprises to upgrade and restructure. Both places will also work out measures to facilitate the business operation of Hong Kong, China-invested enterprises to tap into the mainland market.

- **Cross-boundary infrastructure:** to facilitate the flow of people, goods, information and capital, the two governments will expedite the construction of cross-boundary land transport networks (e.g. Guangzhou-Shenzhen-Hong Kong, China Express Rail Link, Hong Kong, China-Shenzhen Western Express Line and Hong Kong-Zhuhai-Macao Bridge), build a high-class navigation network in the PRD, improve the mechanism of the joint meeting of the five major airports in the PRD, support Hong Kong, China as an international maritime centre and an international logistics hub.

- **Environmental protection:** both Hong Kong, China and Guangdong will strive to complete the 2011-2020 objectives of the delta's regional air quality management plans by 2010, strengthen the co-operative efforts in studying the relationship among photochemical smog, hazy weather and atmospheric quality, and improve the delta's regional air quality monitoring network.

- **Cleaner production:** the two places will implement the Cleaner Production Partnership Programme, support Hong Kong, China-invested enterprises to conduct assessments, develop demonstration projects, provide certification services to assess the effectiveness of the improvement plan, and recognise Hong Kong, China-invested companies participating in the programme with good performance as Hong Kong, China-Guangdong cleaner production partners in its original situation. The two places will become pioneers in introducing electric cars to major greater delta cities such as Hong Kong, China, Guangzhou and Shenzhen, and jointly foster the research and development, manufacturing, general application and development of the relevant auto-parts industry for electric cars in the greater delta region.

- **Education policies** include exploring new operation modes for Hong Kong, China tertiary institutions to offer educational programmes in Guangdong (e.g. set up branches in Guangdong), supporting higher education institutions of both sides to jointly offer educational programmes, encouraging the opening up of educational resources for secondary and primary education and continuing the exchange and collaboration of teacher training.

- **Innovation:** to promote Hong Kong, China-Guangdong industry-university research bases, joint laboratories, joint engineering research centres, humanities and social sciences research bases and innovation and technology parks, and support tertiary institutions from both places to undertake key scientific and technological research projects at national, ministerial or provincial levels.

Source: Hong Kong SAR Government, "Signing Ceremony of Framework Agreement on Hong Kong/Guangdong Co-operation Held in Beijing", *www.info.gov.hk/gia/general/201004/07/P201004070113.htm.*

Increased co-operation arrangements between Hong Kong, China and Shenzhen could form the core of wider co-operation in the Greater Pearl River Delta. More co-operation could take place in formulating strategic urban and transport planning, seamless cross-border transport and less restrictive immigration clearance (for example a more flexible cross-boundary flow of foreign business people). More co-operations could also take place with respect to respective airport operations, with joint airspace co-ordination and possibly a railway connection between the airports of the two cities in order to improve the synergies between the two airport hubs. Co-operation between the financial sectors in Hong Kong, China and Shenzhen could also be deepened, by facilitating inter-bank borrowing, co-operation between the two stock exchanges and facilitate Hong Kong, China banks to establish branches in Shenzhen. Co-operation between Hong Kong, China and Shenzhen in these and other domains could serve as an engine for further integration with Macao, China, Zhuhai and other parts of the Guangdong province.

Different governance arrangements for cross-border regions within the OECD might prove useful for the PRD. Some cross-border regions engage in co-operation on a single theme and create a monothematic committee for this. Such a form of co-operation has been established between Windsor and Detroit, and Tijuana and San Diego. In some cross-border regions a proliferation of co-operation mechanisms takes place on the basis of a common vision for co-operation (such as its Vision 2020), without one strong central organisation overlooking these initiatives. This is for example the case in the Öresund region, where co-operation has taken place in a wide field of areas (higher education, research, entrepreneurship) without the platform Öresund Committee having much to say about this. A third model is governance by a catch-all organisation, for example in the Euregion Meuse-Rhine in the Belgian-Dutch-German borderlands. It disposes of an organisational structure that assembles representatives from the local to the European level, as well as civil society (universities, chambers of commerce, labour unions) in a system of councils, committees and working groups. Considering the on-going co-operation in the PRD on specific issues and projects, there might be a concrete need to link these projects in a holistic development strategy for the whole PRD region, along the lines of the strategy formulated for the Öresund.

Strengthening local capacity to improve metropolitan governance

In order to stimulate metropolitan development, a series of institutional mergers have taken place. Seven county-level cities of comparable strength (Panyu, Huahu, Zinhui, Nanhai, Shunde, Sanshui and Gaoming) became urban districts in 2000, affiliated to the metropolitan areas of Guangzhou, Jiangmen and Foshan. In consequence, the total number of cities and counties decreased from 28 in 1994 (when the PRD Economic Zone was initially established) to 20 in 2003. This trend is expected to continue, as proposals have been put forward to the State Council to designate four other county-level cities (Zengcheng, Conghua, Huiyang and Gaoyao) as city districts under Guangzhou and the prefecture-level cities of Huizhou and Zhaoqing respectively. Guangzhou made large efforts to increase its governing capacity though mergers. Guangzhou expanded its administrative boundaries by merging with the neighbouring county-level cities Huadu and Panyu and increased development control in the area. The Guangzhou Development District, formerly divided into four different development zones, was merged into one zone under one management.

5.3. Main spatial planning challenges

A brief description of Guangdong's spatial planning system

Spatial planning could be used to co-ordinate various sectoral policies in pursuit of common spatial development objectives. In Guangdong, as in the rest of China where a centrally planned economy used to dominate, spatial planning now has primarily centred on the promotion of economic growth. The objective could be clearly observed before China's economic reforms launched in 1978 when urban planning was basically creating site plans for selected cities or industrial hubs designated by the central government. Today, economic development acts as the primary driver of spatial and physical planning and "other factors affecting urban spatial structure, such as public policies, land market, transportation infrastructure, regulation, and housing issues are mostly secondary considerations in the planning process" (Song and Pan, 2007).

Guangdong province's spatial planning is motivated by the aims to restructure the PRD region to facilitate the production of higher value-added goods and de-concentrate production from the Inner PRD. It also seeks to reduce inter-regional disparities by promoting economic development in lagging regions. For the PRD region, spatial planning in Guangdong is applied to strengthen the core (Shenzhen-Hong Kong, China, Guangzhou-Foshan and Zhuhai-Macao, China metropolitan regions) and co-ordinate industrial specialisation of non-core areas. Spatial planning is also used to construct integrated networks of infrastructure (e.g. regional expressway network), promote compact spatial development, through carefully planning land use and limiting sprawl into ecological areas, and to preserve resources and conserve the water supply.

The Guangdong provincial government has been pursuing an ambitious urbanisation strategy, in order to promote economic development. In 2003, the former Provincial Party Secretary of Guangdong, Zhang Dejiang, addressed the Provincial Conference of People's Representatives in these terms: "Guangdong will aggressively promote urbanisation. This is the major strategy for Guangdong to face challenges, seize opportunities, and speed up development" (Nanfang Daily, 2003, quoted in Po, 2007). After the provincial government's publication of the "Advisory on Speeding up Urban and Rural Construction and Promoting the Urbanisation Process" in 2000, the provincial government issued a series of guidelines to support this pro-urbanisation strategy, including the establishment of 270 central towns, redrawing urban administrative jurisdictions, and the reforms of the household registration system. The "Guangdong Urban System Plan, 2006-2020" established targets for the PRD to reach an urbanisation rate of 80% in 2010, with a target for the whole Guangdong province of 65%, and an estimated urbanisation rate for the whole of China in 2010 of 47% (Po, 2007). The latest national strategy for the PRD – "Outline of the Plan for the Reform and Development of the Pearl River Delta region 2008-2020" – further specifies that the urbanisation target should reach 80% by 2012, and 85% by 2020 (see Chapter 3).

A wide spectrum of planning measures affects and shapes the regional planning arena in Guangdong. These include the "PRD Co-ordinated Urban Cluster Development Plan 2004-2020" ("PRD Urban Cluster Plan"), "Guangdong's provincial Territorial Plan 2006-2020", and various national spatial directives which have left an indelible impression on the spatial structure of the area (e.g. "Main Functional Zoning

Plan"). Guangdong's spatial planning system involves, similar to China, a web of different national ministries (Box 5.4). The Guangdong provincial government plays a crucial role over multiple aspects of spatial planning in its territory, including transport planning, capital investment, and industrial development. For instance, the "PRD Urban Cluster Plan" specifies provincial government policy mandates on different zones (Table 5.1).

Table 5.1. **Provincial mandates over local development planning**

Grade	Type of zone	Spatial management measures
Grade I (Surveillance)	Regional green land	Provincial and municipal governments jointly demarcate regional green lands and "red lines" for major transport accesses, which shall not be modified by local authorities. Provincial government controls the green lines and red lines by compulsory measures, while municipal governments are in charge of routine management and development activities.
	Regional transport access	
Grade II (Adjustment and control)	Regional basic industries and heavy equipment manufacturing concentration zones	Provincial government shall establish parameters on type and scope of development, environmental requirements and standards, while municipal governments are in charge of construction. Both governments shall strictly avoid haphazard developments without control that do not comply with regional development goals and anticipated functional definitions.
	Regional major transport hubs	
Grade III (Co-ordination)	Inter-city planning zones	Related cities will be jointly involved in the planning and implementation of local developments to ensure co-ordinated functioning spatial layouts, transport facilities, public utilities, green lands, etc. Based on full negotiations and collaboration, cities should carry out routine development management at their own discretion. The provincial governments are in charge of rectifying any violations to the plans, while respecting the interests of adjacent cities. "Joint conferences" will be held to co-ordinate the development of these zones.
	Guangdong-HK-Macao cross-boundary collaboration zones	
Grade IV (Guidance)	Economic promotion zones	Based on city-town cluster co-ordinated development plans, the provincial government will direct the subsidiary city governments in preparing corresponding municipal planning, development and administrative standards to improve the general socio-economic growth levels and human settlement qualities.
	City-town development enhancement zones	
	Normal policy zones	

Source: Department of Urban and Regional Planning, Guangdong Construction Commission.

Within China, Guangdong is known for having a sophisticated urban plan which seeks to create synergy between cities within the province. With the assistance of the Ministry of Construction in Beijing, the government of the province of Guangdong's Construction Commission prepared the "PRD Urban Cluster Plan" in 2004, which was formally approved by the Guangdong Provincial People's Congress in 2006, making it a statutory instrument requiring compliance by all PRD municipalities. This PRD Urban Cluster Plan differs considerably from previous development strategies for the Pearl River Delta in the following ways. First of all, it is a highly integrative strategy that incorporates inter-city transport, open space conservation, heritage preservation and environmental management into urban system planning. Secondly, it fully recognises that the PRD urban system is not an administrative hierarchy but rather a dynamic network of cities and towns that have merged into urban corridors and clusters that cross municipal boundaries. Moreover, the strategy was prepared through a systematic programme of widespread public consultations across the PRD; and this is the first time in China that a provincial Peoples' Congress has formally approved a sub-provincial regional development strategy. It is hoped by the Guangdong authorities

that these features will enable a shift to a polycentric model that encourages rural-urban linkages and improved use of natural resources and infrastructure delivery.

Through the introduction of new zoning measures, Guangdong aims to provide a comprehensive approach to address the overall spatial development challenges of the province. Of particular importance are the challenges of regional disparities between the PRD and non-PRD region, environmental degradation particularly in the PRD, local government-led inefficient industrial layout, the co-ordination of different sectors, industry, and local plans. The "Guangdong Provincial Territorial Plan" divides the province into six different spatial categories. Zoning is used to facilitate the Inner PRD to upgrade to higher value-added industries and to use the Outer PRD for more conventional industries. Eastern and Western Corridors are expected to focus on promoting economic growth through attracting foreign capital and providing a better business environment. The so-called "moderate development zone" aims to promote a balanced land-use pattern in terms of production, life and ecology while the comprehensive development zone is positioned as an agriculture production site. Finally, the "ecological priority zone" emphasises ecological conservation and the green economy as priorities. Another important zoning measure concerns the nationally introduced Main Functional Zoning Plan, which has divided the province into four categories: "optimised development zone", "key development zone", "restricted development zone" and "prohibited development zone". As this plan is undergoing review by the NDRC, it is not available publicly, and therefore premature to analyse in this review.

Box 5.4. **Spatial planning in China**

Spatial planning in China contains three categories: territorial planning, regional planning, and urban planning, all of which could influence urban development.

National comprehensive spatial planning - namely the "main functional zones" (MFZs), has been reflected in national FYPs. The 11th National FYP outlined MFZs to classify the national territory into 4 different types of zones, according to the region's resources, environmental carrying capacity, development intensity and up-tapped potential, etc. These four types of functional zones include the following: "optimised development zone", "key development zone", "restricted development zone" and "prohibited development zone". Termed as "functional", classified regions are assigned differentiated development focuses. One of the driving concerns behind the differentiation of these zones is to ensure that local governments respond to different sets of incentives, and not only as it was the case in the past to the dominant objective of promoting GDP growth. The 11th FYP claims that "regional policies and performance evaluation [will be determined] according to the principal functional classification" (e.g. for restricted development zones, to emphasise the evaluation of ecological environmental protection, and de-emphasise the evaluation of economic growth, industrialisation and urbanisation level) (OECD, 2006c). Moreover, the functional zoning classification would de facto serve as the platform to co-ordinate different sectoral policies, such as financial policy, investment policy, industrial policy, land policy, population management policy. For instance, the Inner PRD of Guangdong province will be classified as ODZ. Industrial policies of the region therefore should move away from promoting the processing industry and labour-intensive industries that occupy extensive land, and switch to develop high value-added and non-polluting industries. Since different zones will have differentiated development, the regional policy could place significant implications on urban industrial development and urban growth.

Box 5.4. **Spatial planning in China** (*continued*)

The current round of territorial planning in China is in the pilot phase, with the objective to address land-centred spatial development challenges. There has not yet been any national territorial planning in China, despite some sections on regional development in the national FYPs. Since the late 1990s, the Ministry of Land and Resources has began the new round of pilot territorial planning,[1] and successively selected Shenzhen (in 2001), Tianjin (in 2001), Xinjiang (in 2003), Liaoning (in 2003) and Guangdong (in 2005) as pilot places (Liu et al, 2008). A few other provinces, municipalities and economic regions have subsequently been selected, all together covering almost one-third of Chinese territory. Centred on land development, territorial planning also addresses other main spatial development challenges. For instance, Guangdong's territorial planning (completed in 2009) not only formulates a functional definition (e.g. zoning) for different regions in Guangdong, but also tackles the challenges of regional disparities between the PRD and non-PRD region, environmental degradation particular in the PRD, inefficient industrial layout in the PRD, the co-ordination of different sectors, industries, and local plans. Guangdong's Territorial Plan is believed to mostly influence urban land conversion and land leasing income, both of which have largely driven the urban growth of the past decades.

Urban planning, in comparison with the above mentioned "new" spatial plans, has a relative "longer" history and more in-depth technical focus. Through 50 years development, urban planning has accumulated extensive experiences and technical expertise in formulating plans within urban areas. However, quite a few problems emerged. First, while urban planning for large cities like Beijing was formulated relatively systematically, rapid urban expansion since the 1980s quickly made the plan obsolete. A long tradition of master plans has been based on normative projections rather than on economic projections using real time supply and demand data. For example, the estimated demand for residential land is often based on a fixed number of square metres per person multiplied by projected population, instead of on a realistic demand and supply model (Bertaud et al., 2006). Second, except rough blueprints, there was almost no comprehensive urban planning for small and medium-size cities. Large-scale urban construction was made in the 1990s when urban planning was prepared with limited analytical support or even flawed. Third, some urban plans lack consistency, since changing local government leaders tends to require changes in the local urban plan. Since the mid-1990s, continuing rapid urban expansion and increasing inter-city linkages have shifted urban planning from intra-city level to inter-city level. Responding to emerging metropolitan regions, the Chinese government recognised that it is not an administrative hierarchy but rather a dynamic network of cities and towns that have merged into urban corridors and clusters that cross-municipal boundaries. In some regions, urban planning is formulated to incorporate inter-city transport, open space conservation, heritage preservation and environmental management into urban system planning, e.g. "PRD Urban Cluster Plan".

Note 1. Since 1949, China has witnessed four development stages of territorial planning: *i)* in the 1950s the territorial planning got its start; *ii)* from the 1960s to the 1970s territorial planning declined; *iii)* from the 1980s to the 1990s the first major tide of territorial planning began; iv) since the end of the 1990s the new round of territorial planning has been under deliberation.

Source: OECD (2010), "Trends in Urbanisation and Urban Policies in OECD Countries: What Lessons for China", OECD, Paris.

Main challenges

Guangdong's spatial planning system could be improved through a threefold focus on design, implementation and policy monitoring. In particular, points of concern include: *i)* spatial planning that reflects market forces; *ii)* co-ordination of planning amongst different levels of government; and *iii)* improvement of the monitoring of spatial plans.

Spatial planning that reflects market forces

Guangdong's spatial planning framework could be improved if it better reflected land market forces. In market economies, it is assumed that in spite of some price distortions due to subsidies and regulations, the market mechanism allocates land reasonably efficiently between agricultural and urban use. In China, however, the price mechanism that in a market economy self-regulates the expansion of cities into rural areas does not exist. The price paid for farm land at the fringe of cities is not based on market price but is calculated using complex compensation formulas for crops, buildings and pensions for displaced farmers, e.g. land conversion formulas. The compensation is often idiosyncratic and is not always transparent. In particular, it does not differentiate between agricultural land parcels located close to the city centre and those located further away. As Bertaud (2007) notes, "these quotas contribute to the fragmentation of land and the further expansion of cities into the countryside, which is neither desirable for agricultural productivity nor for urban efficiency". In Guangdong it is doubtful that the quantity and the location of the urban land developed each year correspond to an acceptably efficient allocation of resources.

Regional planning legislation in Guangdong does not address the reform of the land conversion quota system, and therefore ignores one of the most important drivers of urban form. An efficient quota system would recognise the value of land at the city fringe and would promote the consolidation in large contiguous areas of both agricultural land and urban land. The reform of quotas could include the design of an urban perimeter, which could be part of the master plan. Within this perimeter all land parcels, whether under current agricultural use or not, could be developed as a priority without requiring the use of a conversion quota. Land outside the perimeter would be protected by conversion quotas, possibly even more stringent than the current ones. In particular, cities that have large areas of undeveloped land within their ring roads would have reduced land conversion quotas, until all the vacant land within the existing ring road has been allocated, this would include open space for recreation. In the long run, of course, the quota system would no longer be required and should be dismantled as soon as a functioning land market is established for agricultural land conversion (Bertaud, 2007).

Policies could be introduced to discourage the suburban sprawl of smaller cities in Guangdong, which would decrease infrastructure costs and the transport costs incurred by an uneconomic urban expansion. It has been demonstrated that the creation of scattered "agricultural enclaves" throughout cities in China have increased infrastructure costs. In Sichuan, for example, it was found that agricultural enclaves increased costs of extending roads, storm drains, sewers, and street lighting by 52% (Bertaud, 2007). Such a spatial pattern also increases travel time and the burden of governments in providing transport network routes. These findings confirm those of cities in the United States, where uncontrolled development has been associated with

greater capital costs related to building more schools and extending roads, water and sewer lines and storm water drainage systems, as found in the United States (Burchell *et al.*, 2002).[1] Policies such as urban growth boundaries, density targets, and urban design guidelines which favour compact urban forms and walkability could be promoted to counteract sprawl.

Co-ordination of planning amongst different levels of government

The Urban Cluster Programme lacks implementation mechanisms that would improve its relevance for planning in Guangdong province. This may be due to the overemphasis on economic development aspects rather than detailed planning for land use, transport or the environment. Overall, urban cluster plans in China, such as that of Guangdong, encourage interactivity, but do not "contain distinct visions for different cities; detailed plan layout in terms of timeline, priority, and agencies; or monitoring and evaluation mechanisms for the implementation of the plans" (Song and Pan, 2007). Second, the plans are initiated by high-level policy makers, but often fall short of statutory power to be implemented by local-level policy makers.

An integrated spatial planning framework requires a clear definition of roles among different spatial plans and agencies. In Guangdong, a series of plans are not strongly connected to one another and often lack reference altogether. These include the "PRD Urban Cluster Plan, 2004-2020", and the "Guangdong Urban System Plan, 2006-2020", as well as the "Guangdong Provincial Territorial Plan, 2006-2020". Given this history, it is likely that the Guangdong Development and Reform Commission's forthcoming "Main Functional Zoning Plan", which outlines the spatial development issues of the province, will be marked by an inadequate degree of connectivity with other plans. Though it is common in OECD member countries to have overlapping planning legislation, most countries have instituted a broader range of co-ordination tools which more clearly define the relative sphere of influence of each document and the degree to which planning legislation can be bypassed through other provincial and national concerns. The 2006 Scottish Planning Act, for instance, places an obligation on public sector agencies to line up their actions and spending plans with the Scottish National Planning Framework and the sub-national planning frameworks. In less formal situations, co-ordination is ensured through inter-local planning agreements and joint powers agreements.

The current spatial planning system leads to difficulties in co-ordination. For instance, during the process of drafting Guangdong's Territorial Plan, almost 80 plans are already in place or in preparation, including not only spatial plans, but also plans with a spatial dimension (e.g. sectoral 11th FYP, Guangdong's Land-Use Plan, Environmental Plan, Expressway Plan, and Coastal Port Placement Plan) and plans at sub-provincial level (Shi and Hu, 2009). This has clearly resulted in huge co-ordination problems. China and its Guangdong province could borrow experiences from OECD member countries, such as the Netherlands, on how spatial planning could serve as a platform to co-ordinate different sectoral policies. In the Netherlands, policy integration is an explicit function of spatial planning instruments at all levels. The Provincial Spatial Planning Commission co-ordinates spatial impacts of sectoral policy at the regional level, through the *Streekplan*, and the *Structuurplan* performs a similar function at the municipal level. New initiatives are being undertaken to increase the integration of regional spatial plans with the statutory environmental policy plan and the water management plans. The aim is to ensure the systematic co-ordination and

synchronisation of publication of the different plans, or their full integration through a single integrative plan at the provincial level. Dutch planning also excels with respect to integrating spatial planning with environmental management. Environmental capacity constraints are being introduced in planning legislation through the concept of "environmental use space", which illustrates the maximum allowable use of environmental resources in a given area (Nadin in OECD, 2001).

Improvement of monitoring of spatial plans

Spatial planning provides an important framework for co-ordination, but at the moment the planning system lacks the tools to monitor the implementation of policy. As policies normally take place in a sectoral manner, each governmental department will have its own method of enforcement and evaluation. Each sectoral policy evaluation scheme is often undertaken internally. It is for example not clear how the "Territorial Plan" could enforce government bodies other than the Department of Land and Resource. A promising mechanism proposed is to make the "territorial plan" obligatory by law.

Ongoing monitoring exercises, especially land market assessments, are essential given the risk that Guangdong's five-year plans will not react to current trends. More rigorous land market assessments could better determine how much land and infrastructure are currently available and project how much additional land and infrastructure need to be developed to accommodate urban growth. Especially in Guangdong, shifts in economic structure and improvements in transport infrastructure are reshaping urban land use. Land for industrial production has been converted into sites zoned for commercial or residential purposes over the past years and this trend is expected to continue as low-end or highly polluting industries move out of the core cities (CBRE, 2008). A wide variety of techniques have been utilised in OECD member countries to conduct a land market assessment and monitor land supply (Box 5.5). Effective land analysis has allowed policymakers to identify areas that are growing the fastest and given them accurate projections in order t-o better plan infrastructure development. Without land assessments, policymakers may allocate infrastructure to areas that are not growing and make growing areas victims of their own "spontaneous urbanisation", which can create long-term patterns of congestion and an inefficiently built environment. At least three separate tools are at the disposal of land administrations. They include such modelling as a land inventory, urban land conversion modelling and land supply monitoring tools (Kaiser *et al*., 1995).

Given the ambitious zoning changes, Guangdong would benefit from a future land-use analysis and scenario modelling. This would help Guangdong's planners better understand the possible effects of changing their zoning structure. Using geographic information systems (GIS) and other software, it would be possible to illuminate the possible effects of: *i)* redevelopment, infill, or brownfields strategies; *ii)* authorisation of land uses that were not previously allowed by the local comprehensive plan; *iii)* changes in the zoning use classification system; and *iv)* changes in standards for public and community facilities or services, including the transport network.

Box 5.5. Examples of land supply and capacity modelling in the United States

Portland Metro (Oregon) is a three-county regional planning organisation that has managed its growth through an urban-growth boundary, although future use of this tool is in doubt. Oregon law required Portland to estimate the capacity of land within the urban-growth boundary every 5 years to ensure that it could accommodate the next 20 years of anticipated growth. Portland has been criticised for the accuracy of its earlier estimates, fuelled by a concern that it is unduly constraining the market for land and leading to housing price inflation. Its regional land information system contains over 100 data layers, including land parcels, zoning, comprehensive plan areas, parks and open space, soils, wetlands, topography, land cover, and floodplains. Portland has not used a market factor but made adjustments for infill housing and employment absorption and under build (estimated at 21% for residential areas), and embedded market considerations in its demand forecasts.

Montgomery County, Maryland, is a "collar" county in the Washington, D.C. metropolitan area that actively uses its land information system to implement the "wedges and corridors" strategy of its general plan and to manage growth under its adequate public facilities ordinance (Godschalk, 2000: 97-117). It sets annual development ceilings for its designated growth policy areas based on transport, schools, and infrastructure. It also uses its parcel-based GIS to support its Transfer of Development Rights Program and its designation of priority funding areas under Maryland's Smart Growth Program. It has conducted a detailed analysis of industrial office and commercial land-use capacity to identify vacant and redevelopable parcels, in response to concerns about the impact of its Growth Management Program on economic development.

Seattle, Washington uses land supply monitoring to assess its land capacity under the Washington Growth Management Act which requires the city's plan to accommodate future population and employment growth within its urban growth boundary. In its 1997 citywide capacity analysis, Seattle classified all parcels as either vacant, available for redevelopment or infill (based on zoning), unavailable (public lands and land precluded from additional development), or within historic districts or institutional planning areas (hospitals, campuses, etc.). Capacity was determined by regulatory status (zoning density) and land use (primarily vacant or underutilised). A 15% market factor reduction was applied for single-family and low-rise multi-family residential uses. For other uses, the market factor was based on a valuation ratio. Capacity was estimated for the city as a whole and for sub-areas.

Anchorage, Alaska, uses land supply and capacity analysis as part of its comprehensive planning process, focusing on the Anchorage Bowl, the 100 square mile area constituting the heart of the municipality. It developed a four-digit coding system. Assessor's records provided data on land ownership and the assessed value of land and improvements. GIS layers used in the analysis included: land use, zoning, environmental features (wetlands, avalanche hazard areas, slopes, floodplains, seismic-hazard areas, and alpine areas), water and sewer lines, streets, and planning sub-areas. Suitability criteria for the development of vacant lands were: generally suitable, marginally suitable (moderate avalanche-hazard areas, slopes of l6 to 35°, class B and C wetlands, 100-year floodplains, and zone 4 seismic-hazard areas), and generally unsuitable (high avalanche-hazard areas, slopes over 35°, floodways, class A wetlands, zone S seismic-hazard areas, or alpine areas above the tree line).

Source: Moudon and Hubner (eds.) (2000), *Monitoring Land Supply with Geographic Information Systems: Theory, Practice, and Parcel-Based Approaches*, John Wiley and Sons, New York, NY, United States.

5.4. Main sub-national finance challenges

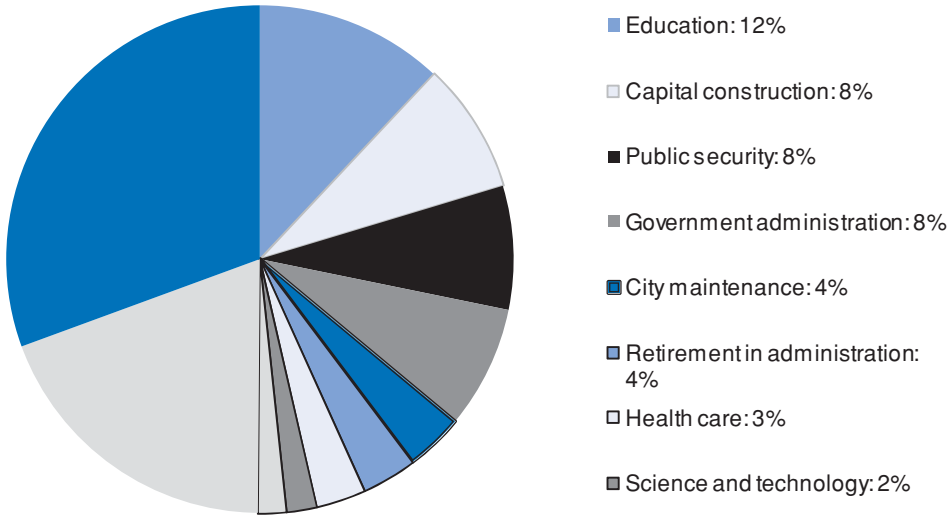
Sub-national finance could be focused on the realisation of Guangdong's economic development goals. The composition of spending in Guangdong could better reflect priorities within the field of economic development by focusing more on education, innovation and R&D. The design of fiscal instruments could be adapted so as to limit congestion and sprawl. And finally, the allocation of funds to counties and cities in Guangdong could be more transparent and predictable in order to further reduce regional inequities.

Re-orient public expenditures in order to stimulate a high value-oriented economy

The province of Guangdong finances a range of public goods and services, including education and infrastructure investment, each representing 12% and 8% of overall expenditures.[4] Other relatively large spending items are public security (8%) and government administration expenditures (8%). The province of Guangdong spends relatively less on health care (3%) and science and technology (2%) (Figure 5.3). Overall public expenditures in Guangdong accounted for around CNY 327 billion in 2006, which translates into approximately USD 500 per capita.

Figure 5.3. **Main expenditure items in Guangdong province, 2006**

As % of overall budget



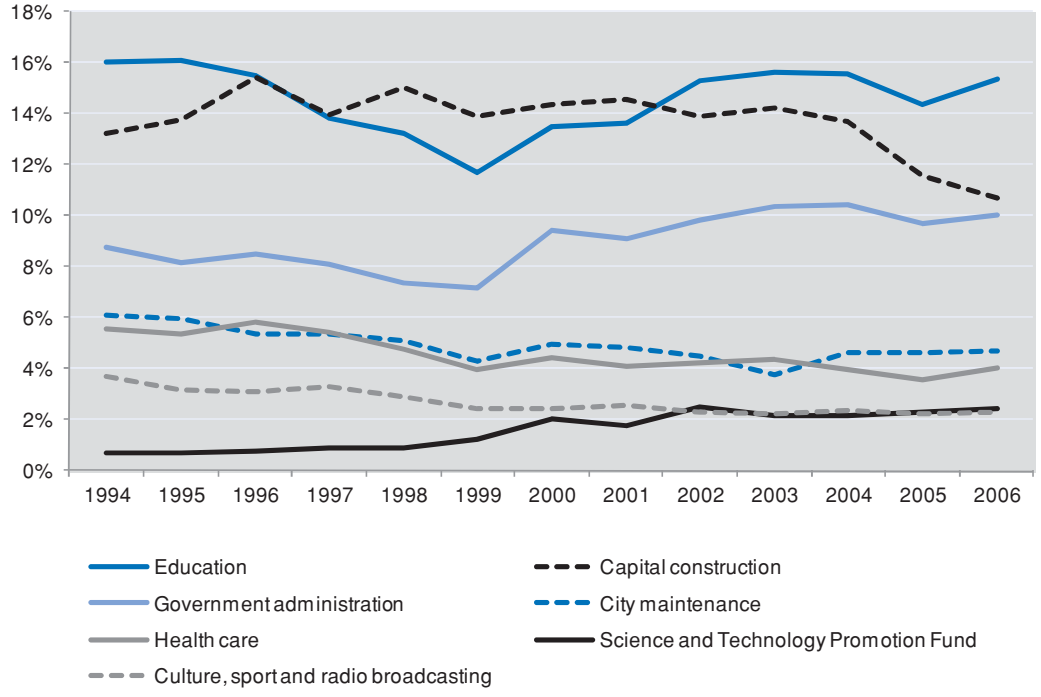
Note: Overall expenditure comprises budgetary expenditure, transfers to central government, budgetary circulating funds, government bond expenses, government bond income balances, other uses of funds, balances for the following year, etc.

Source: *National Bureau of Statistics of China database*, *www.stats.gov.cn/english/statisticaldata/yearlydata*; *CEIC database*, *www.ceicdata.com*.

Although education is the most important expenditure item in the Guangdong budget, it accounted for no more than 15.4% of its budgetary spending in 2006. The rate declined (in relative terms) between 1994 and 1999, but reached a share of expenditure in 2006 similar to what it had in 1996 (Figure 5.4). Spending on education increased to 18.7% in 2008, as a percentage of budgetary spending. Since 1994, the province of Guangdong has increased spending on government administration and science and technology, whereas capital spending declined relative to other spending items. The share of expenditure on science and technology doubled between 1994 and 2006, and the share of spending on government administration grew by a few percentage points. Capital spending peaked in 1996 with almost 16% of expenditures going towards this, but declined to less than 11% in 2006. Longer times series, available for spending on government administration, reveal that the expenditure share on this item peaked in 1984 and declined until 1999, since which it has gone up (Figure 5.5). In the longitudinal comparison, the balance for next year is not considered to be an expenditure item, whereas it is in Figure 5.3, which gave an overview of main expenditure items for Guangdong in 2006. This correction for longitudinal comparison is made as the balance for the following year tends to fluctuate and could thus suggest fluctuations in expenditure shares that do not do justice to reality.

Figure 5.4. **Development of main expenditure items in Guangdong province, 1994-2006**

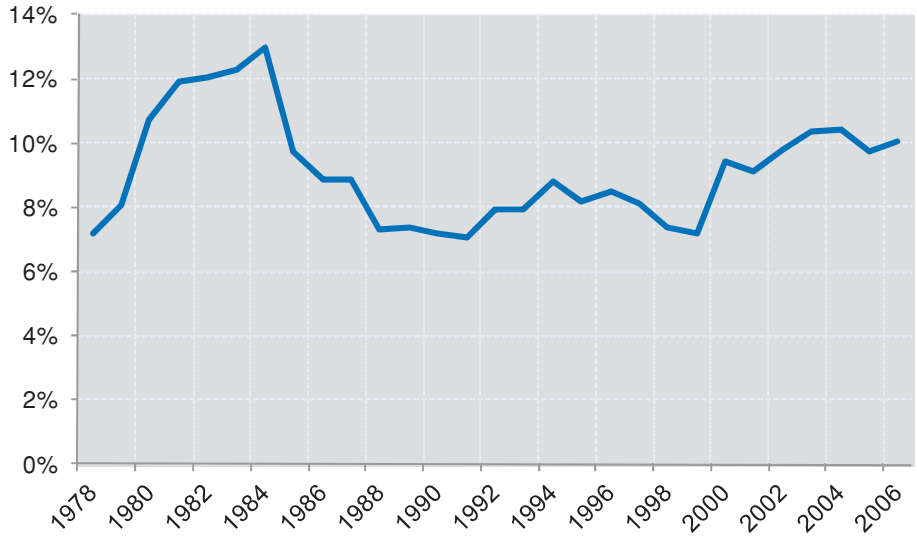
As % of budgetary expenditure



Source: *National Bureau of Statistics of China database*, *www.stats.gov.cn/english/statisticaldata/yearlydata*; *CEIC database*, *www.ceicdata.com*.

Figure 5.5. **Expenditure on government administration as share of total expenditure in Guangdong province, 1978-2006**

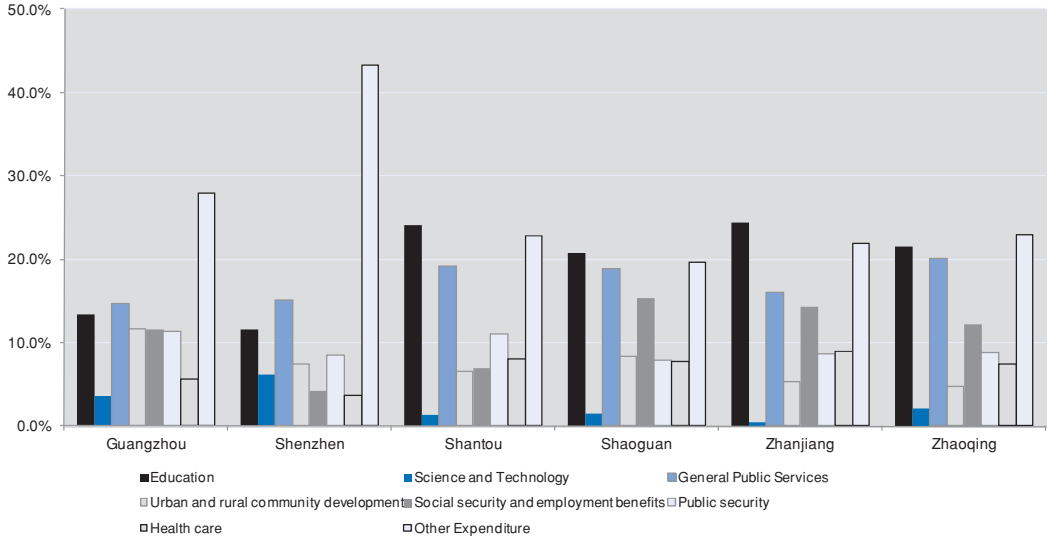
As % of budgetary expenditure



Source: *National Bureau of Statistics of China database*, *www.stats.gov.cn/english/statisticaldata/yearlydata*; *CEIC database*, *www.ceicdata.com*.

There are considerable differences in spending patterns of the different cities in Guangdong, with Shenzhen and Guangzhou investing less in education but more in science and technology (in relative terms) compared to non-Inner PRD cities: 13.5% in Guangzhou, 11.6% in Shenzhen, but 18.7% in Guangdong (Figure 5.6). In 2008, more than 20% of budgetary expenditure in the 4 non-Inner PRD cities (Shantou, Shaoguan, Zhanjiang and Zhaoqing) was invested in education. Shenzhen spends 6.1% of its expenditures on science and technology, against 3.7% in Guangzhou (2% in Guangdong). An expenditure item that is relatively large in Guangzhou (taking up 7% of the budget) is retirement payments for former government administrative staff (Figure 5.6). But apart from these differences, the cities of Shenzhen and Guangzhou have expenditure budgets that look similar to that of the province: a relatively large weight on public security and government administration, and relatively smaller expenditure shares on health care. In the case of Shenzhen, this similarity can be explained by its quasi-provincial status as a "province-managing county". In the case of Guangzhou, this similarity might rather suggest overlapping responsibilities of different levels of government (province and city). Total expenditure per capita in Shenzhen was USD 970 in 2006, against USD 975 in Guangzhou and USD 500 in Guangdong province.

Figure 5.6. **Main expenditure items in selected cities of Guangdong (% 2008)**

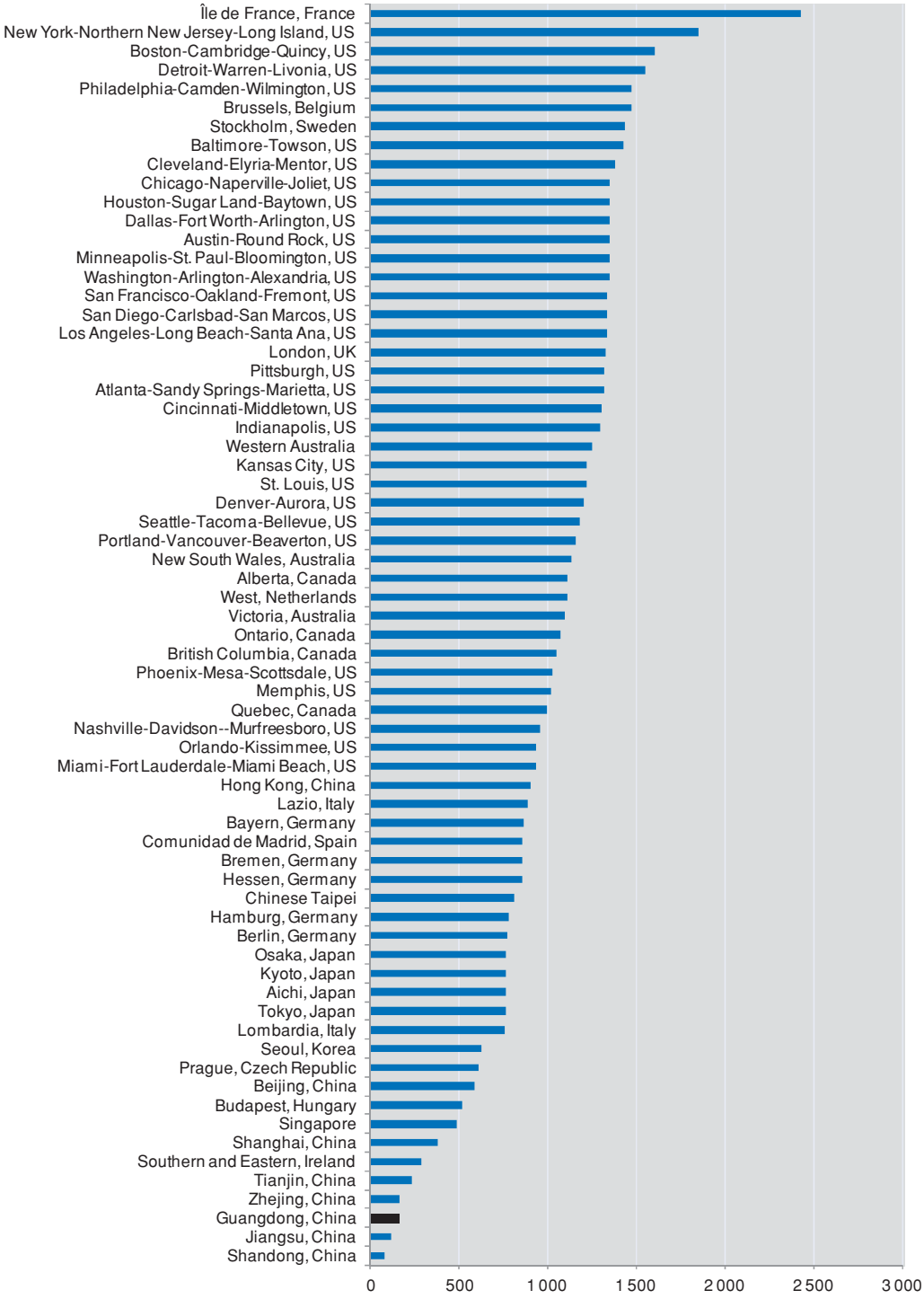


Note: Amounts reflect the percentage of budgetary expenditure. Budgetary expenditure categories changed in 2008, and are thus not directly comparable with 2006 data except spending on education and health care.

Source: *Guangdong Fiscal Statistical Yearbook*, 2009.

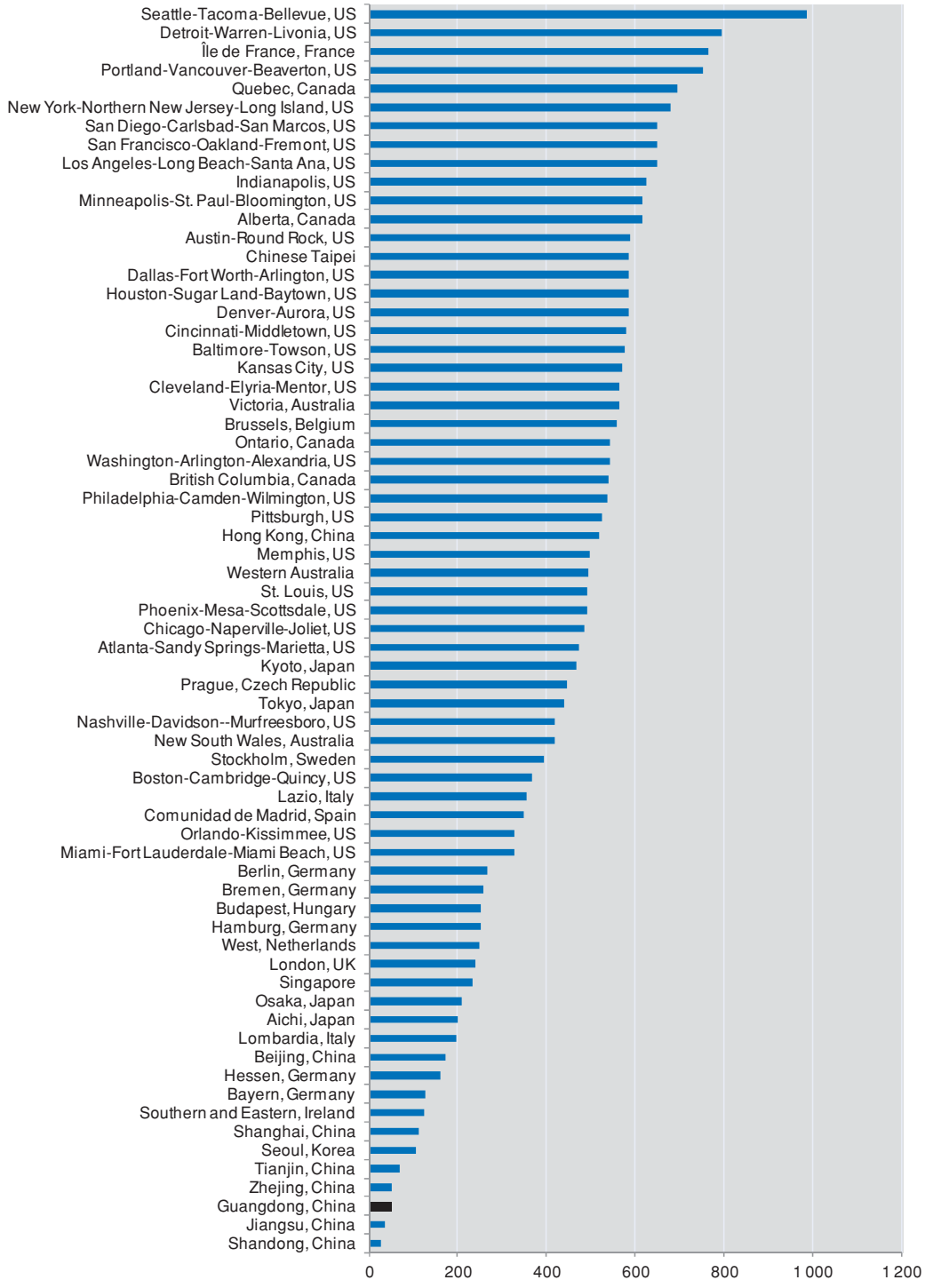
In order to stimulate a higher value-added regional economy in Guangdong, an increase in human capital-related public expenditure might be needed. In comparisons with metropolitan regions in the OECD, Guangdong appears at the bottom end with regards to per capita spending on primary/secondary education, higher education and public R&D, although it has similar spending to metropolitan regions such as Kyoto, Milan and Dublin. As human capital and R&D tends to be concentrated in metropolitan regions in the OECD, this picture might under-estimate the position of Guangdong province in relation to other regions in the OECD; although Guangdong is home to some very large metropolitan regions, parts of the province could also be considered to be rural areas. Within China, spending on these items is similar to the neighbouring provinces of Jiangsu and Zhejiang, but lower than for Beijing and Shanghai, especially with regards to public R&D (Figures 5.7, 5.8 and 5.9).

Figure 5.7. **Primary and secondary education spending in selected metropolitan regions (USD per capita)**



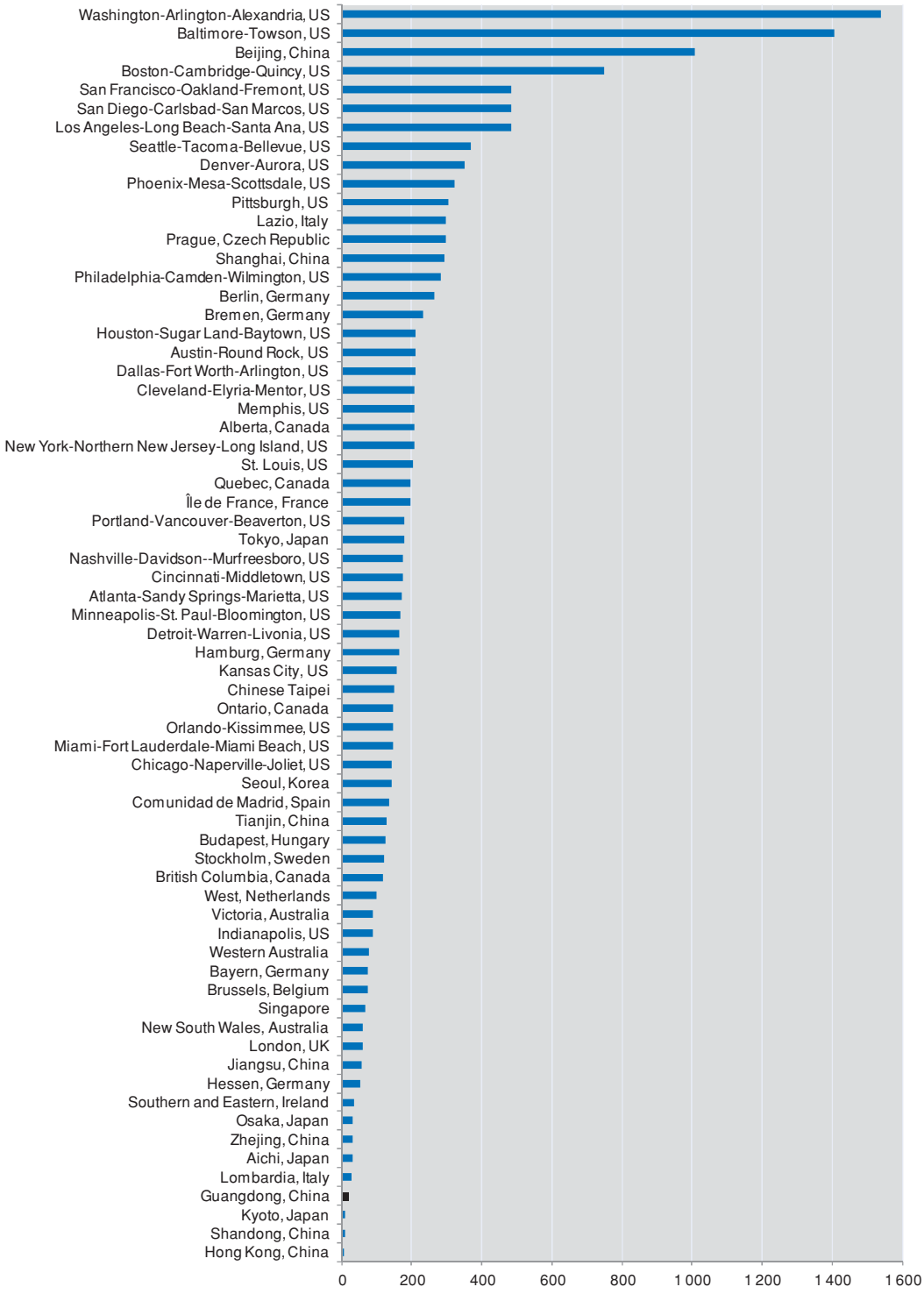
Source: *World Knowledge Competitiveness Indicators Databank* (2008), *www.cforic.org/pages/wkci2008.php*.

Figure 5.8. **Higher education spending in selected metropolitan regions (USD per capita)**



Source: *World Knowledge Competitiveness Indicators Databank* (2008), *www.cforic.org/pages/wkci2008.php*.

Figure 5.9. **Public R&D spending in selected metropolitan regions (USD per capita)**



Source: *World Knowledge Competitiveness Indicators Databank* (2008), *www.cforic.org/pages/wkci2008.php*.

Reduce sprawl and congestion by environmentally sustainable local finance

The main revenue source of the province of Guangdong is tax income, like in its neighbouring provinces. In 2007, tax income represented 57% of total overall revenues,[5] whereas subsidies from central government and the balance from the previous year both represent 16% of the total overall revenues of Guangdong. Smaller revenue sources are administrative fees (4%) and income from penalties (2%). The share of tax income is similar in the provinces that surround Guangdong, such as Zhejiang and Jiangsu. The province of Jiangsu is, however, dependent on central government subsidies for a slightly larger part of its income (20%).

A large part of the tax revenues of the province are shared with the central government, providing limited local fiscal autonomy. The four largest tax revenue sources in Guangdong, representing more than 80% of its tax revenues, are taxes shared with the central government. These tax shares are the result of the 1994 reform which introduced a distinction between central fiscal revenues, shared revenue and local revenue sources.[6] This revenue-sharing arrangement underwent gradual changes after 1994, leading to a situation in which provinces dispose of almost all revenues from the business tax and urban maintenance tax, but smaller shares of the other tax resources that are shared with the central government (Table 5.2). In addition to these shared tax resources, provinces in China have their own tax bases, such as the real estate tax, the vehicle tax and the contract tax.[7]

Table 5.2. **Revenue shares of central and provincial governments in China, 2008**

	Central	Sub-national
Value-added tax	75%	25%
Business tax	3%	97%
Stamp tax on security transactions	97%	3%
Individual income tax	60%	40%
Enterprise income tax	64.2%	35.8%
Urban maintenance and construction tax	1%	99%

Source: *National Bureau of Statistics of China database, www.stats.gov.cn/english/statisticaldata/yearlydata.*

Taxes in Guangdong province and its main cities are mainly levied on business activity, with limited taxation of land use and the built environment. The four main sub-national taxes are: the business operations tax, the value-added tax, the enterprise income tax and the individual income tax (Table 5.3). The real estate tax brings in only a limited share of total tax revenues in Guangdong, whereas it is one of the dominant tax bases of sub-national governments in OECD member countries. There are taxes on the use of urban land, occupying cultivated land, vehicles and on land value, but all of these taxes are relatively marginal, not only in Guangdong, but also in provinces like Zhejiang and Jiangsu, as well as in sub-national averages (Table 5.3). Guangzhou has a more or less similar set of resources, although the individual income tax is less important than for the Guangdong province (Figure 5.10).

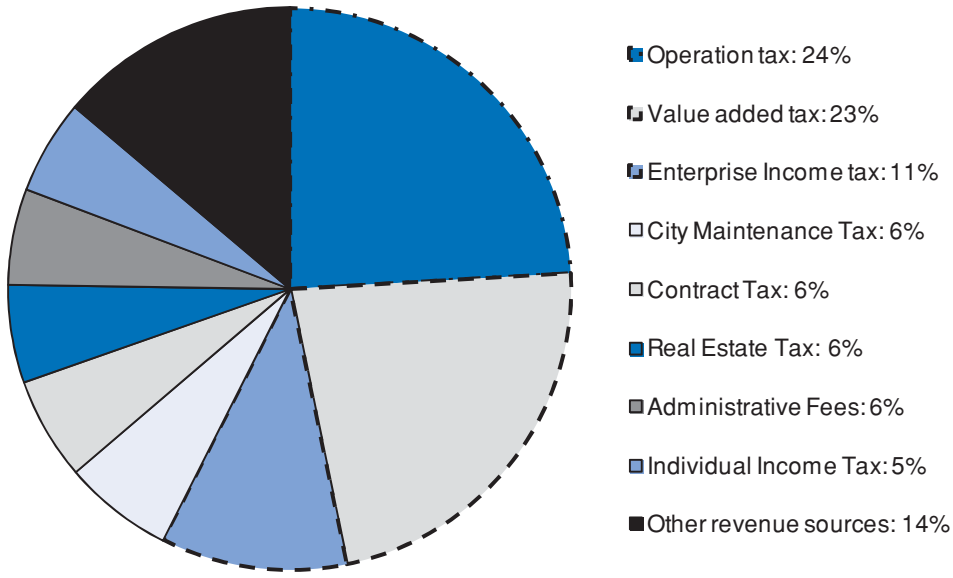
Table 5.3. **Main tax revenues in Guangdong, Zhejiang and Jiangsu, 2008**

	Guangdong	Jiangsu	Zhejiang	Sub-national average
Value-added tax	19.3%	21.2%	19.5%	19.3%
Operations tax	33.3%	29.1%	32.0%	31.8%
Enterprise income tax	18.7%	17.5%	16.9%	17.2%
Individual income tax	8.3%	5.7%	6.5%	6.4%
Resource tax	0.2%	0.2%	0.4%	1.3%
Urban maintenance and construction tax	3.7%	5.5%	6.2%	5.7%
Real estate tax	3.2%	3.0%	3.4%	2.9%
Stamp tax	1.7%	1.5%	1.6%	1.6%
Use of urban land tax	2.9%	3.9%	3.2%	3.5%
Land appreciation tax	2.8%	2.8%	2.2%	2.3%
Use of vehicle and ship tax	0.7%	0.6%	0.5%	0.6%
Occupancy of cultivated land tax	0.4%	1.1%	1.1%	1.4%
Contract tax	4.6%	7.9%	6.5%	5.6%

Note: Revenues listed are percentages of total tax revenue.

Source: *National Bureau of Statistics of China database*, *www.stats.gov.cn/english/statisticaldata/yearlydata*.

Figure 5.10. **Main revenue sources: Guangzhou (% 2006)**



Source: *Guangdong Fiscal Statistical Yearbook*, 2007.

As the current fiscal architecture gives limited fiscal autonomy to local authorities in China to finance priorities such as education and R&D, the share of their own tax revenues (as opposed to tax-sharing revenues) might have to be increased if the use of extra-budgetary revenues is to be avoided. As tax revenue has been insufficient to meet expenditures, local governments have resorted to the use of extra-budgetary revenue. Off-budget revenues and spending have been estimated to be a third (OECD, 2006a) of

official public expenditures. Off-budget spending has been financed by instruments, such as land sales and borrowing via state-owned companies. The current budget law prohibits local governments from borrowing, but does not effectively prevent informal borrowing. Local governments appear to cumulate liabilities through off-budget operations, especially borrowing through their enterprises. At this point it is unclear how large the off-budget expenditures and revenues of Guangdong are. Wider access to its own resources and borrowing could stimulate the reduction of off-budget revenues.

Land sales and lease have been an important source of off-budget income for cities in China (OECD, 2010c; Kamal-Chaoui *et al*, 2009). Municipalities can requisition agricultural land from rural communities with (often inadequate) compensation. The municipalities can then make the land available to industrial investors at relatively cheap prices. To make up for the cheap land offered to industrial investors and to generate extra-budgetary revenue for their own use, municipalities have tended to seek high prices for land auctioned off to property developers. As such, municipal authorities can use the land banks as levers for adjusting housing prices indirectly and for maximising land sale revenue (Tao and Yang, 2008). This has led to large price distortions for land: neither public nor private decision makers currently face correct prices for land. The contribution of land sales to local revenue in Guangzhou has been estimated to range from 20% in the early 1990s to 55% in 2006 (Tian and Ma, 2009). The city of Shenzhen depended on these sales for around 80% of its total local government revenues throughout the 1990s (Peterson, 2006). Although land-use rights could be valuable instruments to capture land value increases and finance infrastructure, in practice local governments were so motivated to generate revenues from land sales and leasing that they generated an oversupply of land. This has stimulated sprawled development and loss of cultivated land. Similar dynamics, although less extreme, are at work around other metropolitan regions in the OECD. Municipalities in the peri-urban fringe of many German agglomerations compete with each other to attract inhabitants and companies via the development of new land, bringing in gains that are used to finance public services. This dynamic is made possible by municipal autonomy in land-use planning and a large demand for building land; the result is an undermining of sustainable planning principles.

Although recent reforms have tried to rationalise and restrict land sales as a financial tool, their effects in Guangdong are currently unclear. Since 1997 the Guangzhou municipal government requires that all urban land, except land used for public services, has to be acquired though tender or auction, in order to reduce oversupply of urban land, curb land speculation and nurture the land market. As such, Guangzhou has taken the lead in the comprehensive introduction of auction and tender in the China land market (Tian and Ma, 2009). The Chinese central government imposed heavy restrictions on the sale of land by sub-national governments, which were implemented in 2008.

New own tax revenues could be in the form of smart taxes that might solve some of Guangdong's challenges within the physical domain, such as sprawl and congestion. Proper pricing of environmentally sensitive services such as waste collection, water treatment, or transport can help contain environmental degradation. Several countries charge waste collection fees based on the amount of waste produced, and similar schemes based on volumes are applied for water and energy. In addition to these, several fees and charges could both serve a revenue-raising purpose and as an

instrument to reduce sprawl and environmental degradation. Three such instruments are: congestion charges, parking fees and development charges.

- A **congestion charge** is an effective instrument for regulating traffic congestion, decreasing air pollution and a revenue source to fund urban infrastructure. The congestion charge, increasingly applied in various metropolitan areas, has been shown to considerably reduce congestion, ranging from a 14% reduction in Milan (over 2008), 15% in London (2002-2003) and Singapore (1998) and 22% in Stockholm (January-July 2006) (Beevers and Carslaw, 2005; Olszewski, 2007; Milan Municipality, 2009; Johansson *et al.*, 2008). In addition, it has been observed to reduce CO_2 emissions up to 19.5% (in London), along with emissions of other air pollutants (Beevers and Carslaw, 2005). Some of these initiatives (Singapore, Milan) are designed to tax higher polluting vehicles more heavily, and different technologies support congestion charging systems.
- **Parking fees** can have similar effects as congestion charges, but might be easier to implement. Parking fees and taxes are price-elastic, and there is ample evidence that they are effective in reducing car trips and decreasing the car share in the modal split, in addition to generating revenue. Parking charges have led to a 12% decrease of vehicle miles of commuters in US cities, a 13% point reduction of car shares in modal splits in British cities, a 20% reduction in single car trips in Ottawa and a 38% increase of car pooling in Portland (Shoup, 1997; Bianco, 2000; Dasgupta *et al.*, 1994, Willson and Shoup, 1990).
- **Development charges** could be used to cover the costs of urban infrastructure development, but alot depends on their design. Development charges are levied on developers to provide funding for the infrastructure needed to provide services to the developed area. They are in principle good instruments for compensating for the costs of sprawl, as long as they take into account real costs and as long as charges for single detached homes are considerably larger than those for apartments. More efficient use of the development charges would imply charging a fee to developers that closely resembles the real and full costs for building and providing infrastructure to a particular area. The effects of development charges on social equity appear ambiguous. On the one hand, low income families might try to find affordable housing far from the city centre; internalising costs of sprawl could raise the price of this housing so that they become unaffordable to these groups. On the other hand, development charges can include a partial subsidy to finance social housing inside the development area.

Fiscal equalisation

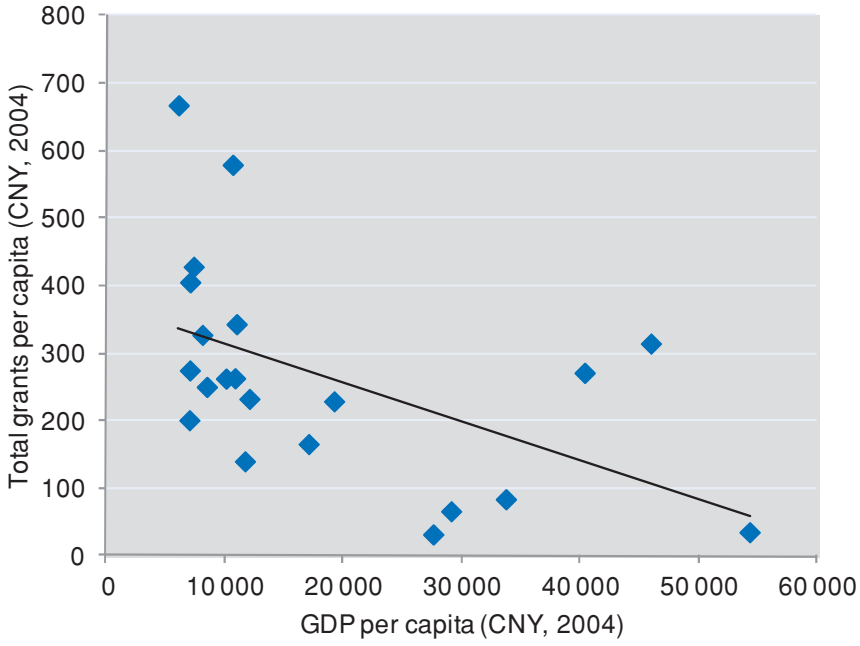
An effective equalisation scheme, both within and between provinces, might smoothen urban-rural migration patterns. As one of the wealthy Chinese provinces, Guangdong does not receive an equalisation grant. This formula-based inter-provincial equalisation transfer was launched in 1995. The formula of this transfer is determined by three factors: the standard revenue of the province, the standard expenditure of the province and the share of the provincial standard fiscal gap of the total fiscal gap. This transfer has remained relatively small: it represented about 7% of total transfers in 2004 and a majority of central transfers, in the form of a tax rebate, have been

negotiated with provinces, thus almost preserving the pre-1994 pattern of inter-regional fiscal distribution (Shen *et al.*, 2006).

Equalisation within Guangdong province takes mostly place via *ad hoc* grants, rather than via general grants as is the case in many OECD member countries. These *ad hoc* grants represent a larger share of the budget than the general grant: only 23% of total grants to counties and cities in the Guangdong province are general grants, with considerable variety among counties and cities, ranging from 0% (Guangzhou and Shenzhen) to 45% (Heyuan).

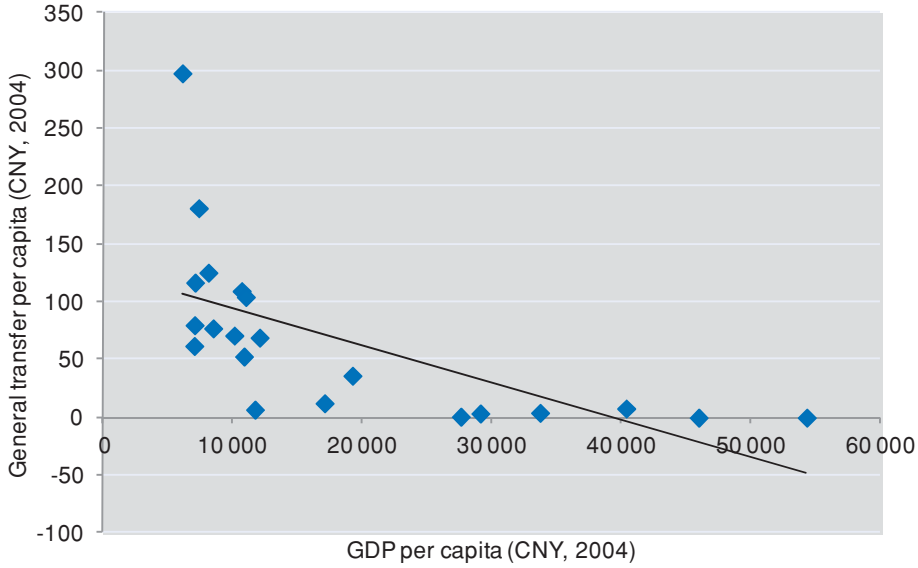
This form of equalisation has reduced inequities within the province, but the approach to equalisation might become more standardised and transparent. The allocation of grants in Guangdong province has limited regional inequities within the province, as richer counties and cities of the province received smaller amounts of grants per capita than did the poorer counties and cities (Figure 5.11). Although this is particularly the case for general grants (Figure 5.12) (which were not received by the richest cities of the Guangdong province such as Guangzhou and Shenzhen), also the non-general grants also tend to benefit poorer counties and cities relatively more (Figure 5.13). Compared with most general grants in OECD member countries, a large share of the equalisation in Guangdong takes place via the *ad hoc* grants, therefore predictability and transparency need to be improved. In order to improve the prospects for long-term budgetary planning of counties and cities in Guangdong, the share of grants that is allocated via a general grant with standardised and objective allocation criteria, would have to be increased.

Figure 5.11. **Total grants per capita and GDP per capita in Guangdong's counties and cities (2004)**



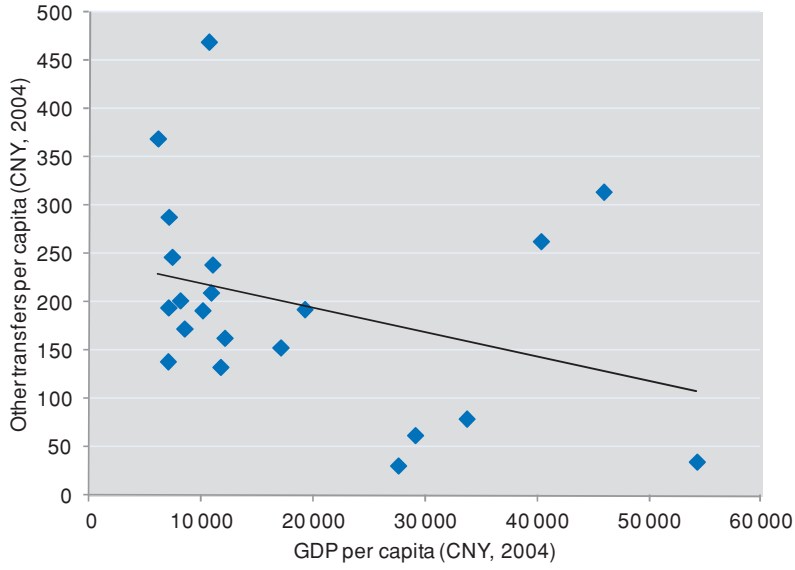
Source: Ministry of Finance (2004), *China Fiscal Statistics of Prefecture-level Cities and Counties*, China Fiscal and Economy Publishing, Beijing.

Figure 5.12. **General grants per capita and GDP per capita in Guangdong's counties and cities (2004)**



Source: Ministry of Finance (2004), *China Fiscal Statistics of Prefecture-level Cities and Counties*, China Fiscal and Economy Publishing, Beijing.

Figure 5.13. **Other grants per capita and GDP per capita in Guangdong's counties and cities (2004)**



Source: Ministry of Finance (2004), *China Fiscal Statistics of Prefecture-level Cities and Counties*, China Fiscal and Economy Publishing, Beijing.

Notes

1. The status of the sub-provincial city is hierarchically lower than a province, yet above regular prefecture-level cities. For instance, the mayor of a sub-provincial city is equal in status to a vice-governor of a province.

2. The Shanghai Port Range Management Committee is represented by Vice Minister of Transportation, Vice Mayor of Shanghai, Vice Governors of Zhejiang and Jiangsu provinces, as well as senior government officials in charge of economic development and transportation from Shanghai, Zhejiang and Jiangsu.

3. The most complete empirical work on sprawl *The Costs of Sprawl – 2000*, applied scenarios based on estimates of uncontrolled (sprawl) and more controlled growth for 15 economic areas in the United States. The result of five years of research, the study found that sprawl would result in USD 227 billion in additional costs in the United States over a 25-year period (Burchell *et al.*, 2002). Controlled growth, it was found, could be achieved with only a 20% increase in density and a 10% increase in floor area ratio for non-residential uses.

4. Overall expenditure comprises budgetary expenditure, transfers to central government, budgetary circulating funds, government bond expenses, government bond income balances, other uses of funds, balances for the following year, etc.

5. Overall revenue comprises budgetary revenue, subsidies from central government, government bonds from the previous year, other sources of funds, balances for the following year, etc.

6. This reform followed the logic that taxes that can be used in the pursuit of maintaining national objectives were assigned as central taxes; taxes that could be interpreted as more relevant to economic development were assigned as shared taxes; and taxes more suitable to be collected and administered by local governments were assigned as local taxes.

7. With the 1994 reform, VAT and excise taxes were brought under the central tax administration and a programme of tax rebates was instituted to return a fraction of these revenues to the province of origin, so that each province would receive at the minimum the VAT and excise tax revenues it retained in 1993.

Annex A

Accessibility of strategic locations in Guangdong and Hong Kong, China

While road densities give a general indication of relative accessibility, the most accurate measures of actual accessibility are drive times. We conducted GIS-based analysis for this *Territorial Development Review* of road-based accessibility to eight strategic locations in Guangdong: Guangzhou in the Inner PRD and Hong Kong, China; Huizhou in the eastern part of the Outer PRD; Jiangmen and Zhaoqing in the western portion of the Outer PRD; Shantou in the Eastern Coastal Corridor; Shaoguan in the Northern Region; and Zhanjiang in the Western Coastal Corridor. Locations were selected to compare the relative accessibility of cities in the Inner and Outer PRD, and Guangdong's three peripheral regions.

Accessibility was measured by calculating one-, two-, and three-hour drive-times from each location in 1990, 2009, and 2020/2030 based on the stock and location of high-speed roads. These durations generally correspond to economic activities at the urban/regional scale. For metropolitan regions in many OECD member countries, the bulk of labour markets are found within a one-hour drive-time from the metropolitan core.[1] In many metropolitan areas, rising land costs have pushed low and medium value-added manufacturing to outer suburbs and smaller cities within a two-hour or even three-hour drive-time,[2] leaving the production of high value-added components and final assembly generally within the one-hour drive-time zone. Similarly, advanced producer and logistics services – and most knowledge providers, such as universities and research institutes – are within a one-hour drive-time from metropolitan cores. Most daily metropolitan retail markets are also well within the one-hour zone. For smaller cities, the one-hour zone captures most of the urban economy, although suppliers of intermediate inputs and raw materials can also extend into the two- and three-hour drive-time zones.

Drive-times were calculated as follows: *i*) all 344 segments of existing and planned expressways (and the 1990 National Highway network) were classified according to design speeds; *ii*) to account for congestion, speeds were reduced within urban areas with population densities higher than 3 000 inhabitants per square kilometre, based on the density calculations described in Chapter 1; *iii*) speeds were also reduced in areas with a slope greater than 8°; *iv*) resulting GIS algorithms were applied to calculate travel times in one-hour increments up to three hours; and *v*) GIS was used to calculate habitable land areas and populations[3] in each drive-time zone. The results are notional estimates of **potential** labour, consumer, input, and industrial land markets in each of the 8 strategic locations in 1990, 2009, and 2020/2030.

Guangzhou

Guangzhou's one-hour drive-time area covered 414 square kilometres in 1990 and captured a potential marketshed of 2.9 million residents (Figure A.1). With the addition of expressways, the area more than doubled to 985 square kilometres by 2009 encompassing a population of 7 million (Figure A.2). High value-added manufacturers and logistics services providers consequently have a far larger range of locational choices in 2009 within an hour's drive from Guangzhou's central core. Future expressway construction will not appreciably change Guangzhou's one-hour drive-time area: by 2020/2030, it will cover 1 066 square kilometres and encompass a population of approximately 7.4 million (Figure A.3).

The metropolitan region's two-hour drive-time area grew 4.7 times from 2 166 square kilometres in 1990 to 10 157 square kilometres in 2009; accessible population grew from 5.6 million in 1990 to 21.7 million in 2009. With expressway construction, most cities in the Inner PRD are now within a two-hour drive-time from Guangzhou. The Nansha container port in the southern portion of the Guangzhou PLC, opened in 2004, is within this 2-hour drive-time zone. These accessibility improvements have provided suppliers to Guangzhou's pillar industries with a far broader range of affordable locational choices that still are within daily reach of these pillar firms (e.g. automotive parts suppliers to Honda, Toyota). By 2020/2030, the 2-hour drive-time area from Guangzhou will expand by 11.4% to 11 313 square kilometres compared to the 2009 level; population will increase to around 26.4 million.[4]

In 1990, a very limited area of 6 380 square kilometres was accessible within a 3-hour drive from Guangzhou: by 2009, that area had quadrupled to 25 400 square kilometres. The Guangzhou metropolitan region today has access within a three-hour drive-time to a far wider range of suppliers and consumers across most the PRD. By 2020/2030, that area will grow by 20% to 30 464 square kilometres and spill over into the Northern and Western Regions.

Figure A.1. **Guangzhou drive times, 1990**

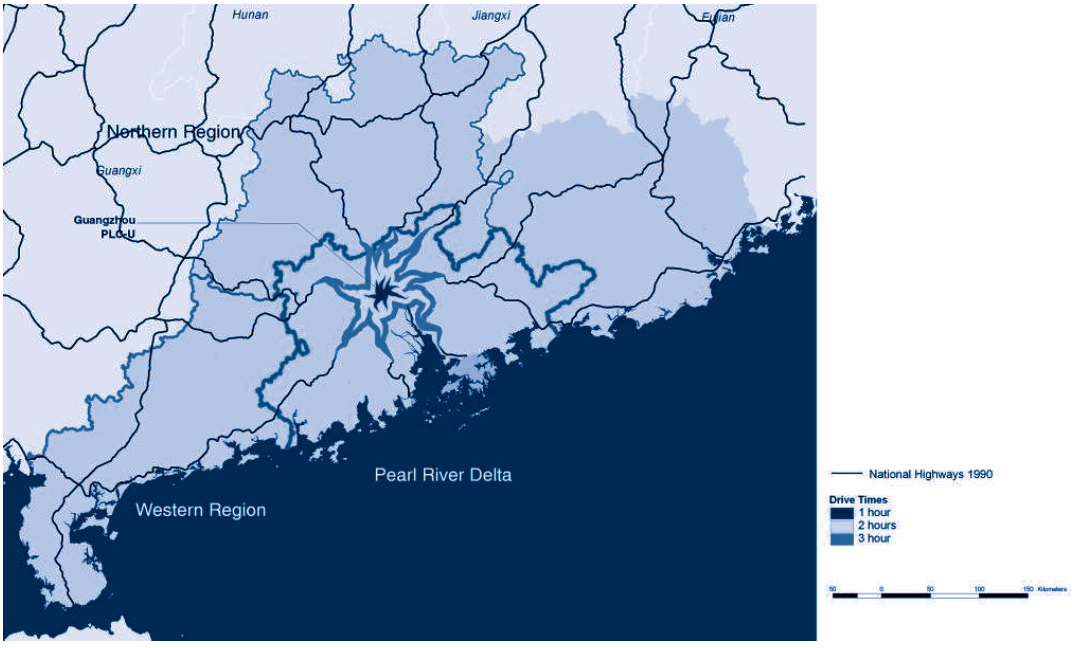


Figure A.2. **Guangzhou drive times, 2009**

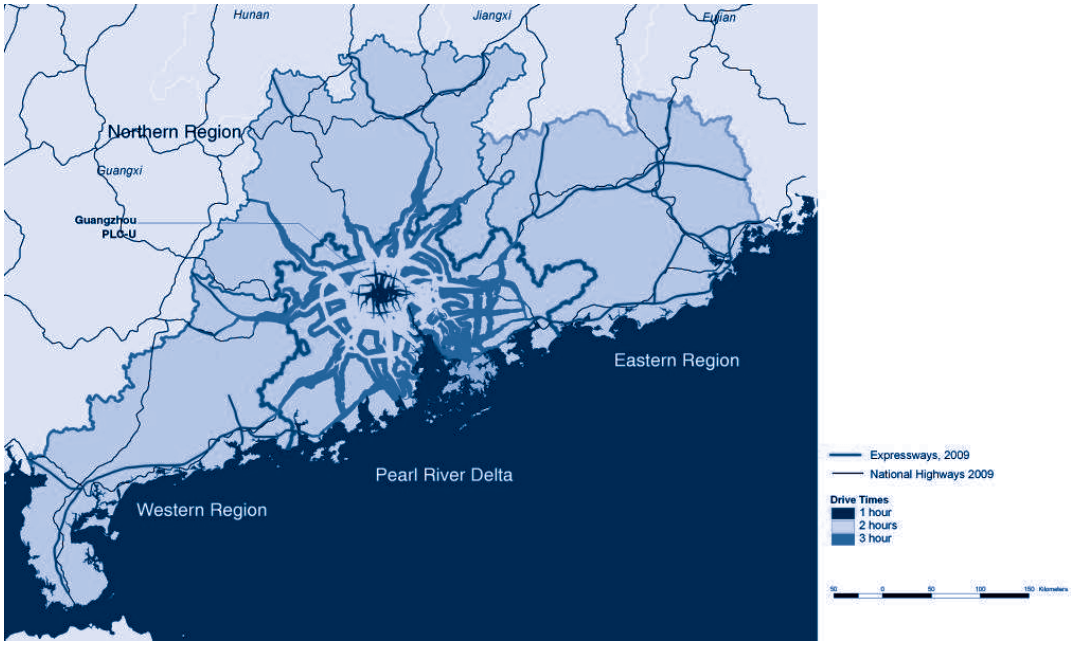
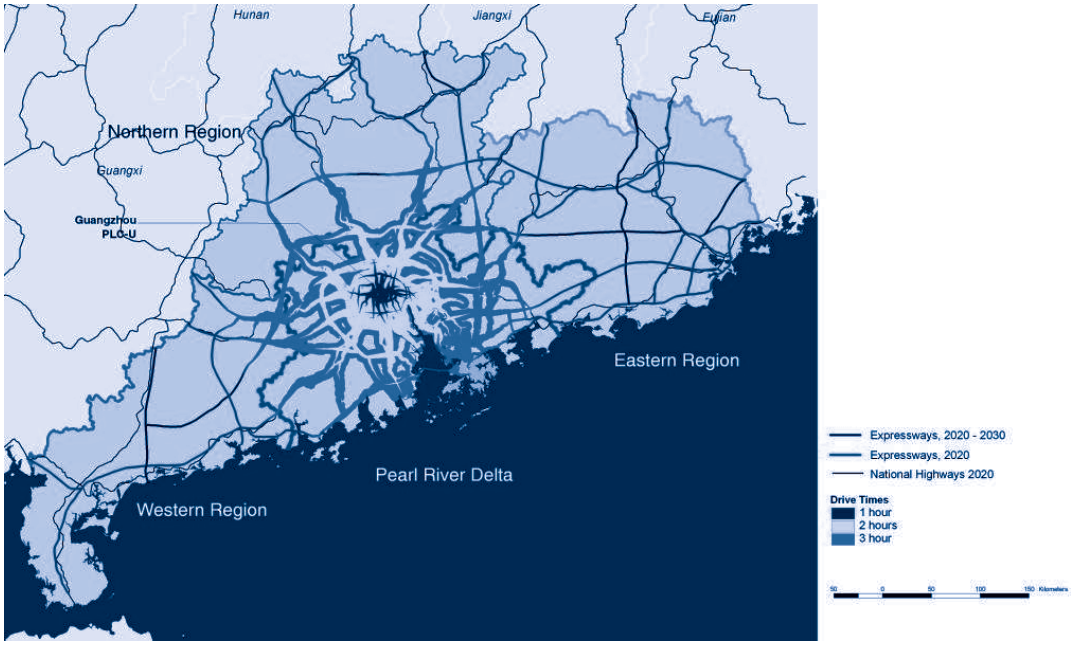


Figure A.3. **Guangzhou drive times, 2020/2030**



Hong Kong, China

Hong Kong, China has very different patterns of accessibility due to border controls and resulting delays that add to travel times and therefore to generalised transport costs. In 1990 and until very recently, accessibility was constrained by two borders: between Hong Kong, China and Shenzhen; and checkpoints at the border of the Shenzhen SEZ with the rest of Guangdong province that were used to control migrant inflows into Shenzhen. As a result, the one-hour drive-time from container terminals at Kwai Tsing near the centre of Hong Kong, China did not cross over to the mainland and only covered a portion of the colony's territory in 1990 (103 square kilometres, holding 4 million residents) (Figure A.4). Expressway, tunnel, and bridge construction expanded the one-hour drive-time area to encompass all of Hong Kong, China by 2009 (1 075 square kilometres, with a population of 6.9 million) (Figure A.5). However, although there have been major improvements to cross-border procedures, the one-hour drive-time area still does not cross into Shenzhen. Even after the completion by 2015 of the Hong Kong-Zhuhai-Macao Bridge across the Pearl River, the one-hour drive-time from Kwai Tsing will not extend to Zhuhai in the western portion of the Inner PRD (Figure A.6).

Two-hour drive times have increased from 467 square kilometres in 1990 to 1 765 square kilometres in 2009, partly due to the removal of the highway checkpoint at the SEZ border with the rest of Guangdong. In 1990, the 2-hour drive-time zone extended to the northern boundary of Shenzhen; unsurprisingly, this narrow strip of territory, accessible in a day-long roundtrip, was where Hong Kong, China firms (and later, from Chinese Taipei) focused their investments as they relocated manufacturing from the colony in the 1980s and 1990s. By 2009, the 2-hour drive-time zone covered most of Shenzhen and reached as far as the southern portion of Dongguan. Population accessible within 2 hours grew from 5.6 million in 1990 to 14.3 million in 2009. GDPG's Expressway Programme to 2020/2030 will have negligible impacts on Hong Kong, China's 2-hour catchment area in the eastern portion of the Inner PRD. However, completion of the Hong Kong-Zhuhai-Macao Bridge across the Pearl River will significantly improve accessibility to the western part of the Inner PRD: Zhuhai will be within a 2-hour drive-time from Kwai Tsing. Hong Kong, China's 2-hour drive-time zone will expand to 1 820 square kilometres and cover a population of 16.5 million by 2020/2030.

The 3-hour drive-time area in 1990 covered 1 091 square kilometres; by 2009, this area had expanded to 6 110 square kilometres, holding a population of 20 million people as far as the eastern suburbs of Guangzhou. By 2020/2030, most of the western portion of the Inner PRD will be accessible within three hours from Kwai Tsing, including the southern suburbs of Guangzhou. **The implications for Hong Kong, China firms is that, for the first time, the western Inner PRD will become as viable an industrial location from an accessibility perspective as the eastern portion has been for the last three decades.**

Figure A.4. **Hong Kong, China drive times, 1990**

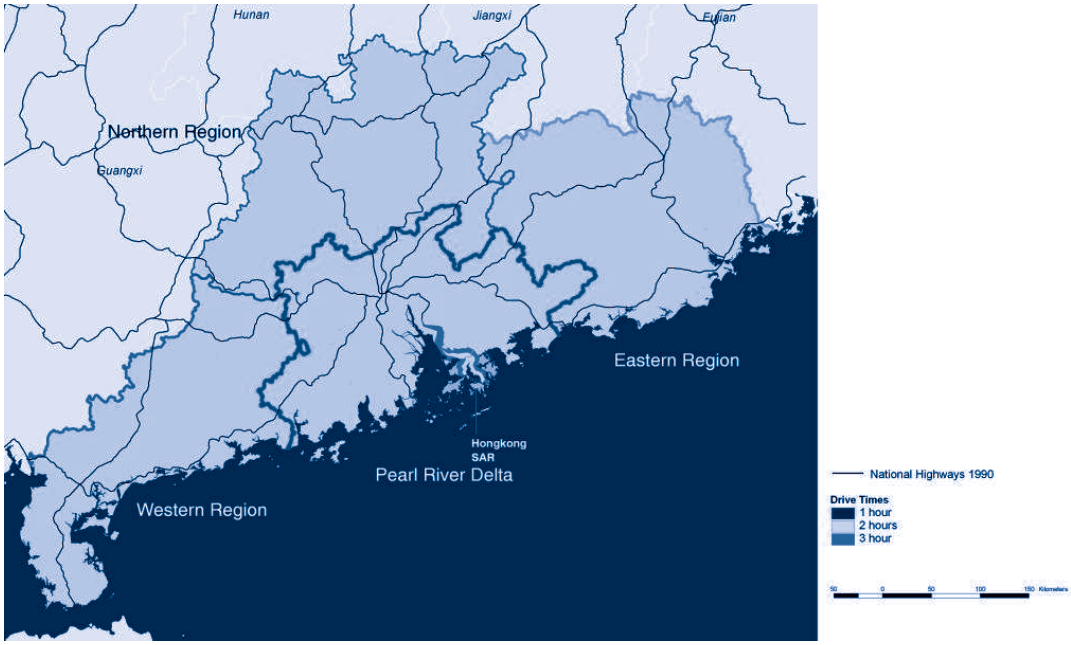


Figure A.5. **Hong Kong, China drive times, 2009**

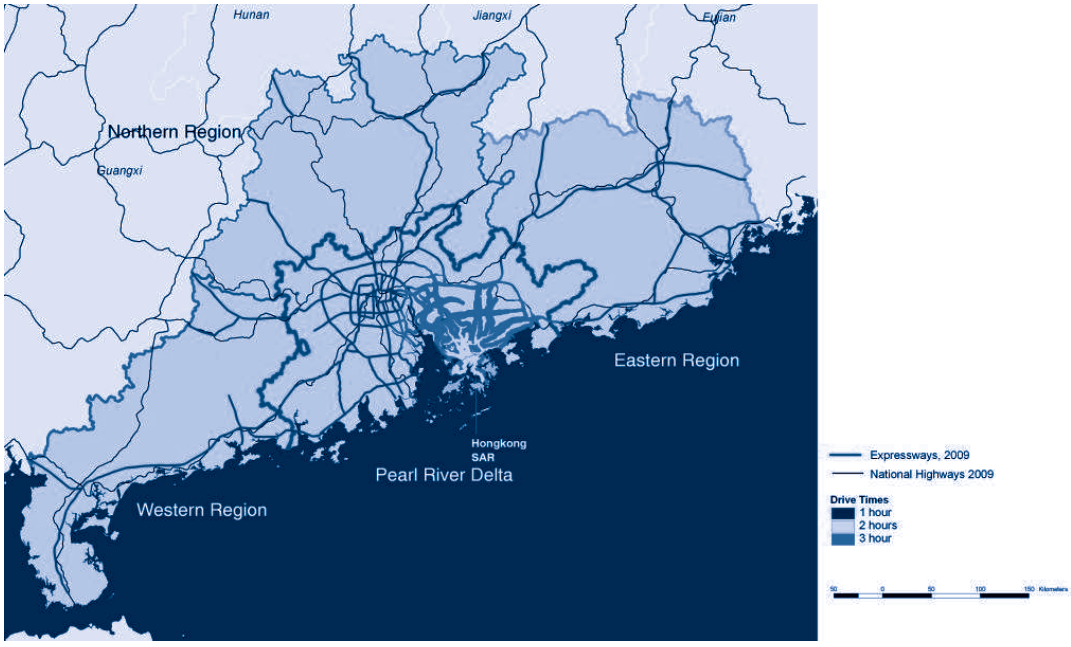
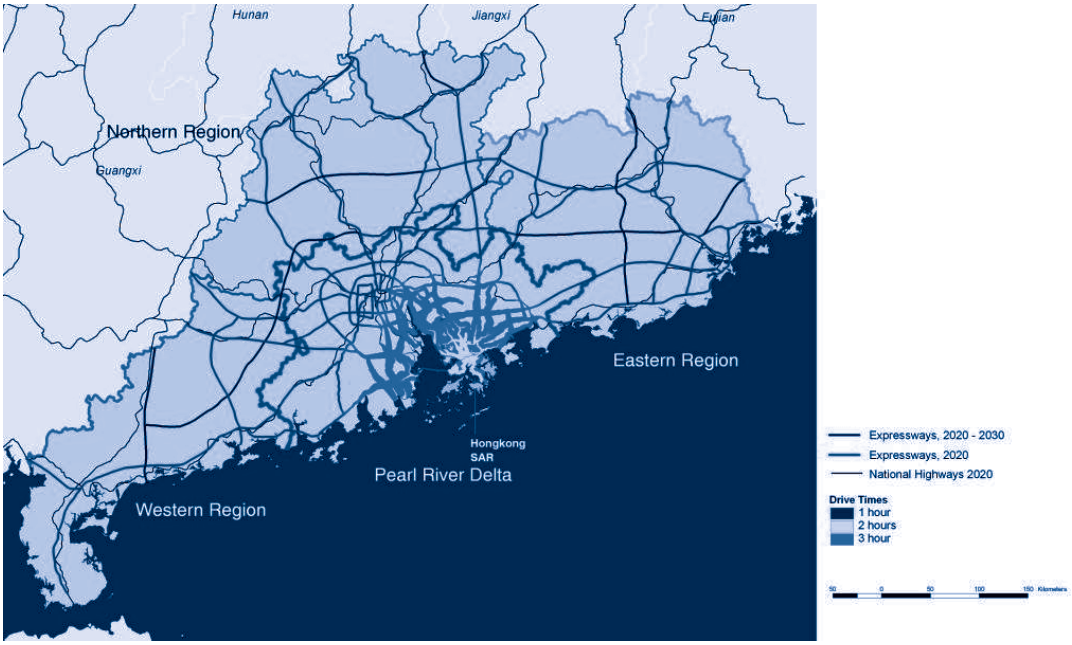


Figure A.6. **Hong Kong, China drive times, 2020/2030**



Huizhou

In 1990, Huizhou was well beyond access to coastal ports, and off the horizon of Hong Kong, China and Chinese Taipei investors who focused on Shenzhen and Dongguan (Figure A.7). Huizhou's 1-hour drive-time was only 234 square kilometres, serving a population of 263 000. The city's 2-hour drive-time zone was narrow: 784 square kilometres with a population of 550 000. Its 3-hour drive-time area covered 2 377 square kilometres with a population of 1 million.

By 2009, the city's 1-hour drive-time area had only grown to 384 square kilometres and held 834 000 residents (Figure A.8). However, Huizhou's 2-hour drive-time area expanded by 6.6 times to reach 5 154 square kilometres with an accessible population of 8.1 million. Significantly, Huizhou is now within a two-hour drive to Dongguan, most of Shenzhen, and the coastal container ports at Nansha and in Shenzhen. Its 3-hour drive-time has extended to cover the eastern half of Guangzhou and part of the western portion of the Inner PRD (in total, 14 413 square kilometres with a total population of 32 million). Both the two-hour and three-hour drive-time zones have now also extended into the less-developed Eastern Region.

Huizhou's one-hour drive-time coverage will not change as a result of planned expressway investments to 2020 and 2030 (Figure A.9). However, its 2-hour drive-time coverage will expand somewhat to 5 903 square kilometres holding a population of 12 million. Its 3-hour drive-time coverage will expand another 3 000 square kilometres to reach 5 902 square kilometres with an accessible population of 41 million. Both the 2- and 3-hour drive-time zones will extend by 2020/2030 further into the Eastern Region and into the southeast portion of the Northern Region.

The significance of Huizhou's drive-time changes from 1990 is that this city, located in the Outer PRD, has become a viable industrial location that competes, in terms of accessibility, with locations in the Inner PRD. Industrial land costs are significantly lower than in Shenzhen, Dongguan, and Guangzhou.

Figure A.7. **Huizhou drive times, 1990**

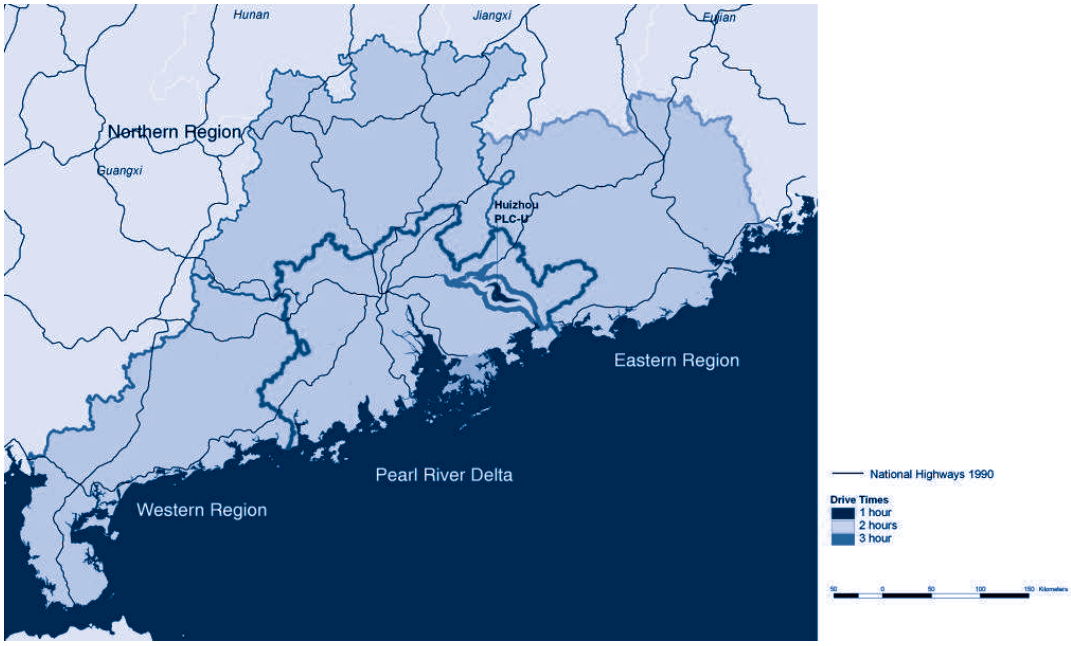


Figure A.8. **Huizhou drive times, 2009**

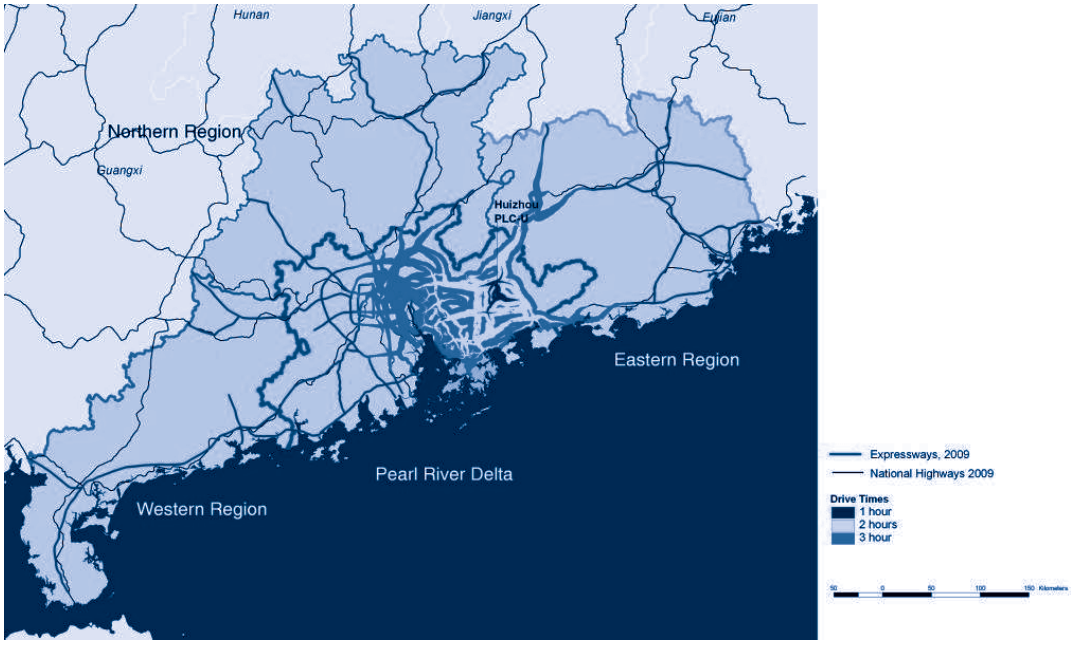
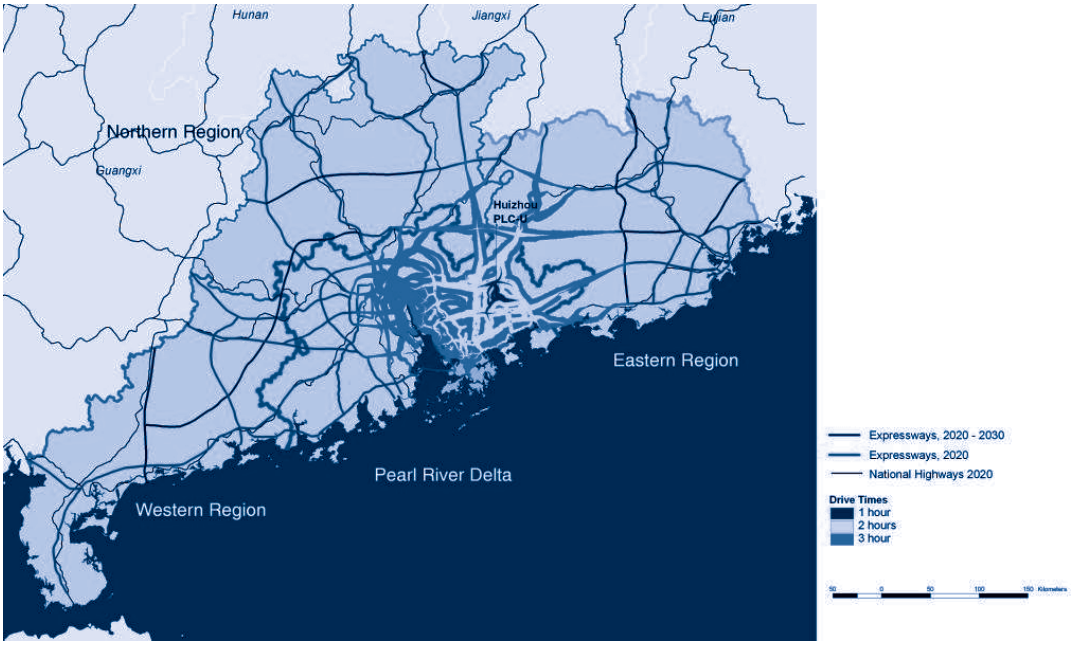


Figure A.9. **Huizhou drive times, 2020/2030**



Jiangmen

Located in the eastern portion of the Outer PRD, Jiangmen was very isolated in 1990 (Figure A.10). Its 1-hour drive-time was only 75 square kilometres with a population catchment of 247 000 inhabitants. Two- and 3-hour catchments were small: 221 square kilometres and 670 square kilometres respectively.

While still small in comparison to other locations, by 2009, Jiangmen's 1-hour drive-time area had increased to 168 square kilometres holding a population of 485 000 (Figure A.11). However, its 2-hour catchment had expanded dramatically by 27 times to reach 5 907 square kilometres encompassing a population of 10.8 million. Jiangmen's two-hour catchment now covers all of the eastern portion of the Inner PRD, most of Guangzhou (including the Nansha container port), and stretches to the eastern limits of the PRD. Similarly, its 3-hour drive-time area expanded by 25 times to cover an area of 17 671 square kilometres with a population of 33.7 million: this area now extends across the western portion of the Inner PRD, including access within 3 hours to container terminals in Shenzhen.

By 2020/2030, Jiangmen's 1-hour travel-time zone will not change, and its 2-hour zone will expand by only 260 square kilometres to 6 167 square kilometres with an accessible population of 12.4 million (Figure A.12). The 3-hour zone will expand by 13.5% to reach 20 000 square kilometres with an additional population of 10 million. Most of this expansion will occur in the eastern part of the PRD and into the less developed Western Region. Significantly, Hong Kong, China's Kwai Tsing container terminals will be accessible from Jiangmen within three hours.

Similarly to Huizhou on the eastern side of the Outer PRD, Jiangmen's accessibility has improved since 1990 such that it has become a viable industrial location that competes, in terms of accessibility, with locations in the Inner PRD. Over the next decade, it will be able to access the full range of container ports in the PRD within a three-hour drive-time.

Figure A.10.**Jiangmen drive times, 1990**

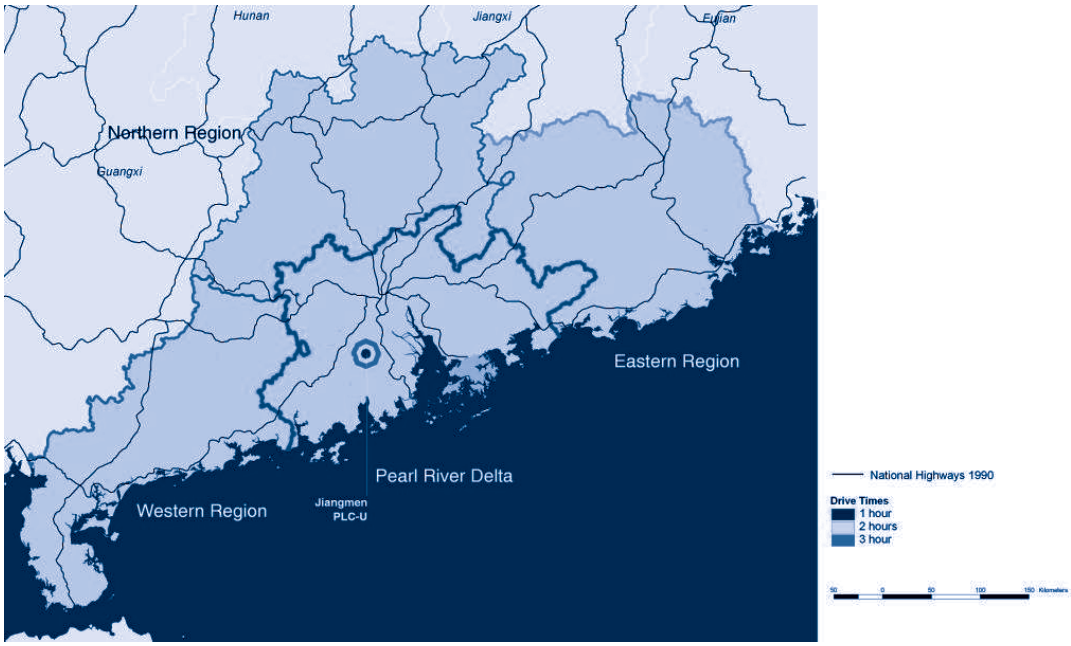


Figure A.11.**Jiangmen drive times, 2009**

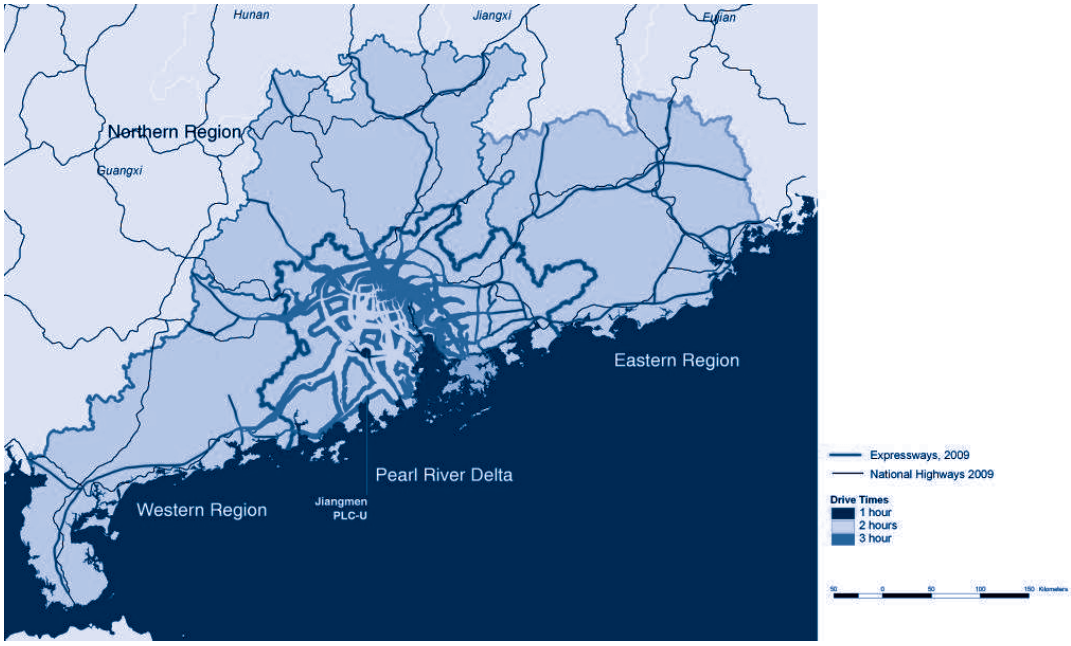
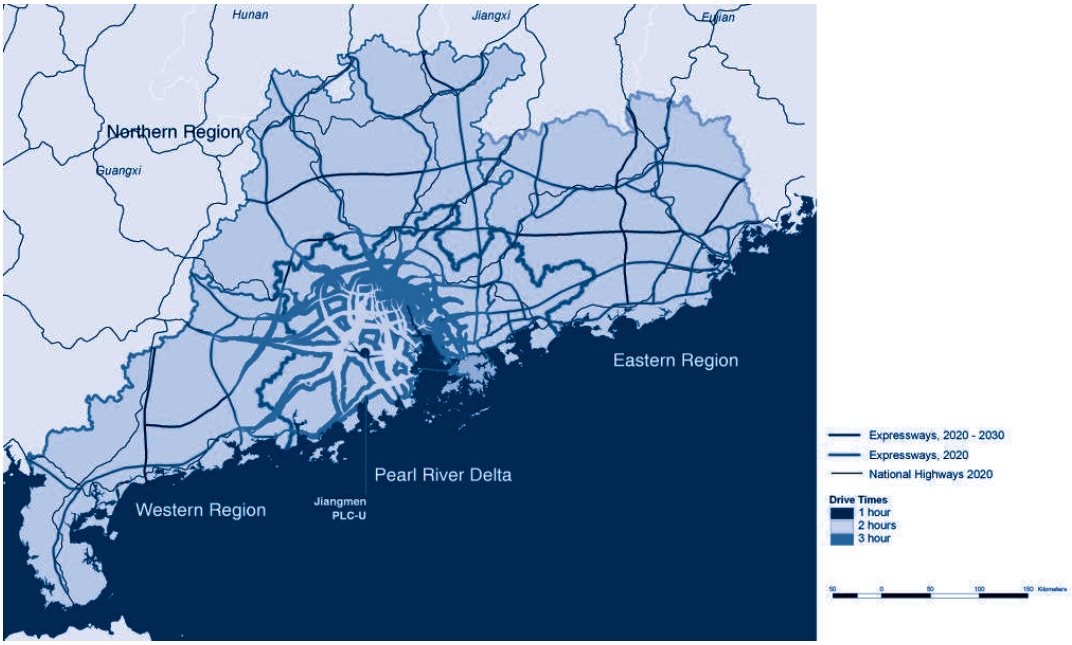


Figure A.12. **Jiangmen drive times, 2020/2030**



Zhaoqing

Zhaoqing is located at the northwest edge of the Outer PRD, adjacent to both the Northern and Western Regions. In 1990, its 1-hour drive-time was 314 square kilometres with an accessible population of almost 400 000 people (Figure A.13). Its 2-hour catchment areas was 1 112 square kilometres, about half of Guangzhou's; 702 000 people lived within a 2-hour drive of Zhaoqing. In the absence of expressways, the 3-hour drive-time was 3 295 square kilometres with a population of 1.27 million. Both the two-hour and three-hour catchments barely crossed into the Northern and Western Regions.

By 2009, Zhaoqing's 1-hour catchment area had almost doubled to 605 square kilometres with a population of 657 000 (Figure A.14). Far more significant was the expansion of its 2-hour catchment by almost 6 times to reach 6 510 square kilometres holding a population of almost 10 million. Zhaoqing's two-hour catchment is the second largest, after Guangzhou, of the eight locations modelled in this analysis. It extends to cover most of Guangzhou and reaches well into the northern territory of the Western Region. The three-hour catchment now covers most of the eastern portion of the PRD and all of Guangzhou, including Nansha port.

Expressways planned to 2020/2030 (Figure A.15) will have little impact on Zhaoqing's 1-hour travel-time area, but will extend the 2-hour catchment to 7 435 square kilometres (with 10.8 million residents) and the 3-hour catchment to 24 627 square kilometres (with 32 million residents). Significantly, the two- and three-hour catchments will extend halfway across the Western Region. Hong Kong, China will be accessible within a three-hour drive from Zhaoqing on completion of the Hong Kong- Zhuhai-Macao Bridge.

From an accessibility perspective, generalised transport and land costs associated with locating industry in Zhaogqing are now similar to those in Huizhou and Jiangmen.

Figure A.13.**Zhaoging drive times, 1990**

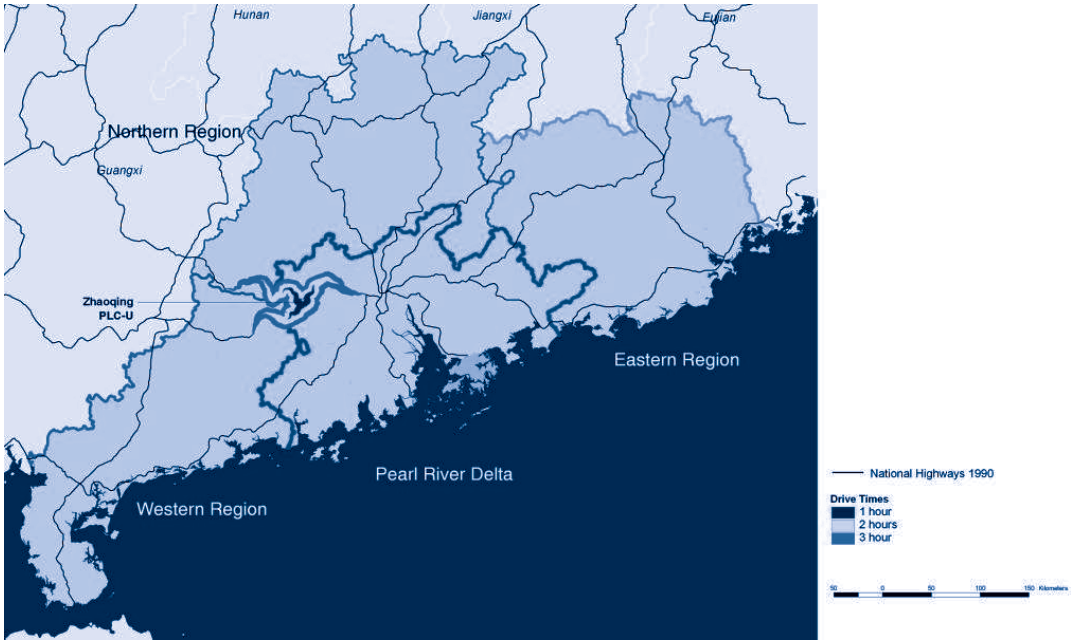


Figure A.14.**Zhaoging drive times, 2009**

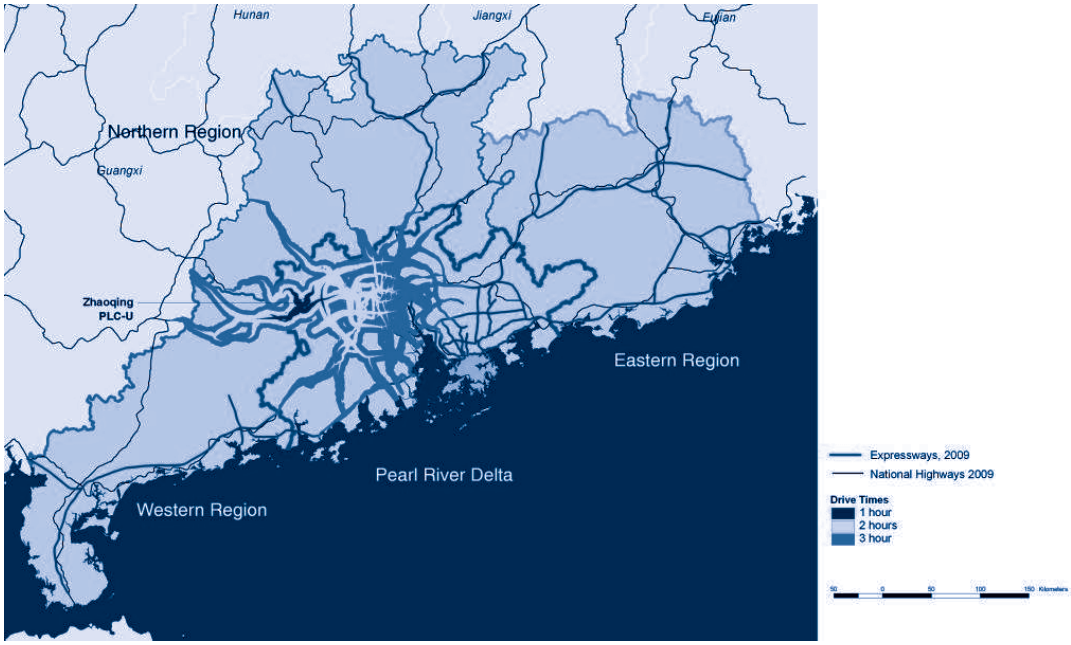
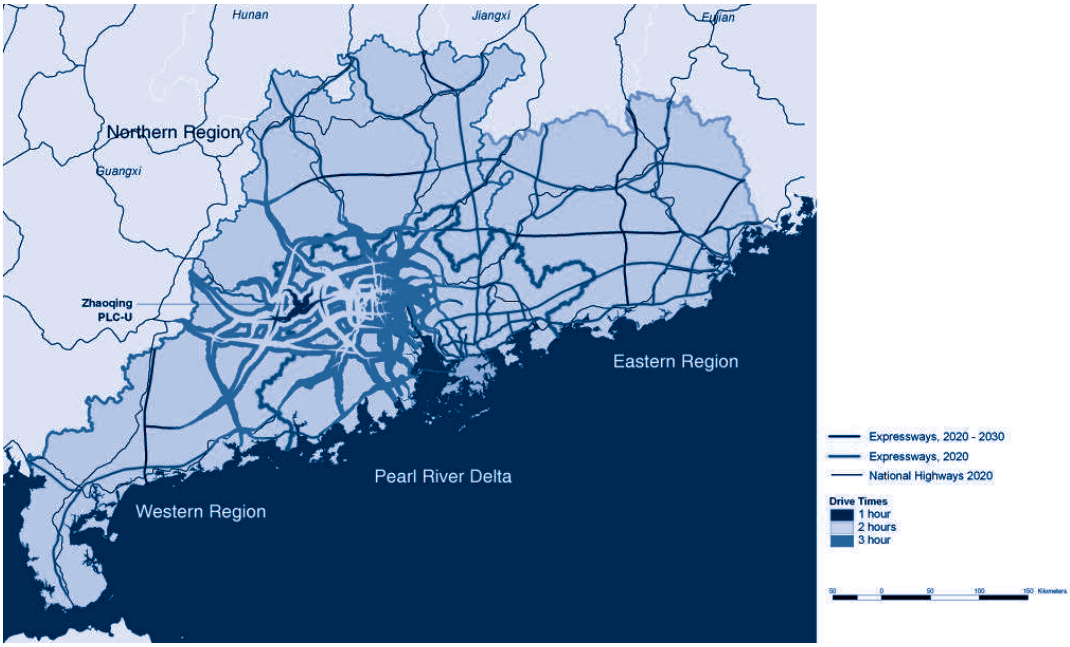


Figure A.15.**Zhaoging drive times, 2020/2030**



Shantou

Beyond the PRD, Shantou is the largest city in the Eastern Region and the core area of the Shantou-Chaozhou-Jieyang cluster in the Chaosan Plain. Unlike the relatively flat Pearl River Delta, the Chaoshan Plain is surrounded by steep topography which constrains accessibility. In 1990, Shantou's 1-hour drive-time area held 592 000 people across 160 square kilometres (half the area of Zhaoqing's 1-hour catchment in 1990). Shantou's 2-hour catchment was 761 square kilometres with a population of 3 million, and its 3-hour catchment reached 2 322 square kilometres and a population of 5.86 million, almost 6 times larger than Huizhou's in 1990 (Figure A.16).

By 2009, Shantou's 1-hour catchment area had doubled to 325 square kilometres; the population within a 1-hour drive more than doubled to 1 475 million (Figure A.17). The city's 2-hour catchment area grew by 3.5 times to reach 2 695 square kilometres (but still less than half of Zhaoqing's 2-hour catchment area in 2009), capturing a population of 6.6 million. The 3-hour travel-time zone also tripled to 7 491 square kilometres (37% of Zhaoqing's), holding a population of 12.2 million. Shantou's two- and three-hour catchment areas have extended to cross the border with Fujian province and northwards into the centre of the Eastern Region.

By 2020/2030, Shantou's 1-hour catchment area will grow slightly to 739 square kilometres and hold a population of 762 000 (Figure A.18). Its 2-hour catchment will grow by 40% compared to the level in 2009 to reach 3 758 square kilometres with an accessible population of 9.9 million. Most cities and large towns in the south-eastern part of the Eastern Region will be within a two-hour drive from Shantou. The three-hour catchment will reach well into the central area of the Eastern Region, covering an area of 11 273 square kilometres holding 16.9 million residents.

Overall, accessibility in all travel-time increments has improved significantly in Shantou since 1990, and will continue to improve through to the completion of GDPG's planned Expressway Programme. The Shantou-Jieyang-Chaozhou cluster will by then become accessible to over 70% of the Eastern Region's population within a 3-hour drive-time. Shantou's coastal port could provide an important distribution hub for bulk cargo and some manufactured products. Although its container terminal is currently very small (2 x 25 000 ton berths) it could expand if demand grows for manufactured exports from the Eastern Region.

Figure A.16.**Shantou drive times, 1990**

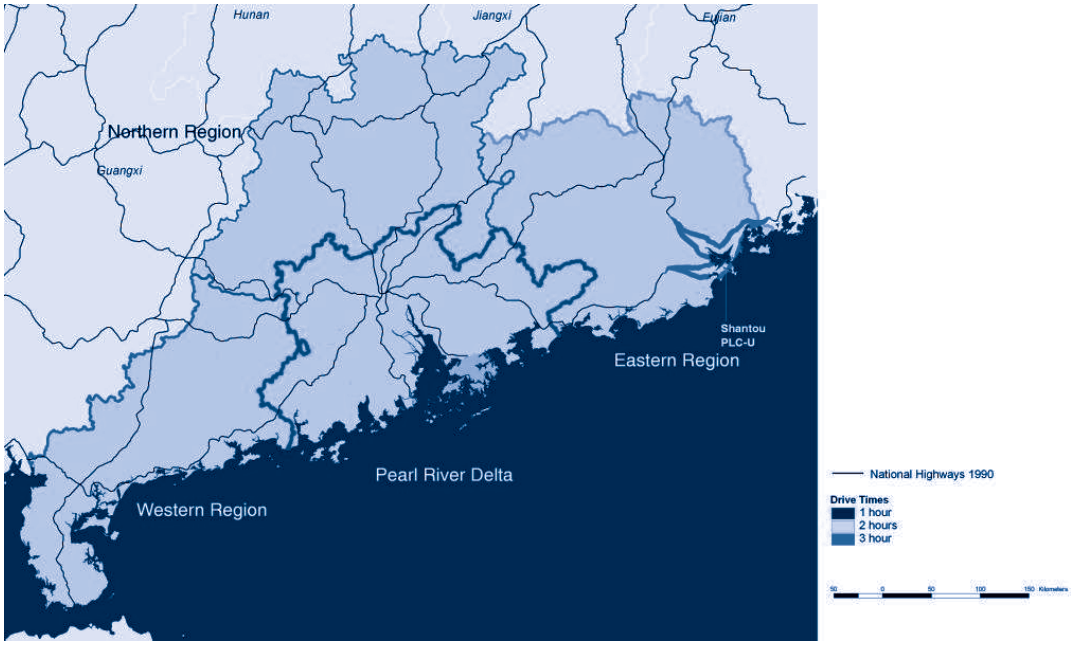


Figure A.17.**Shantou drive times, 2009**

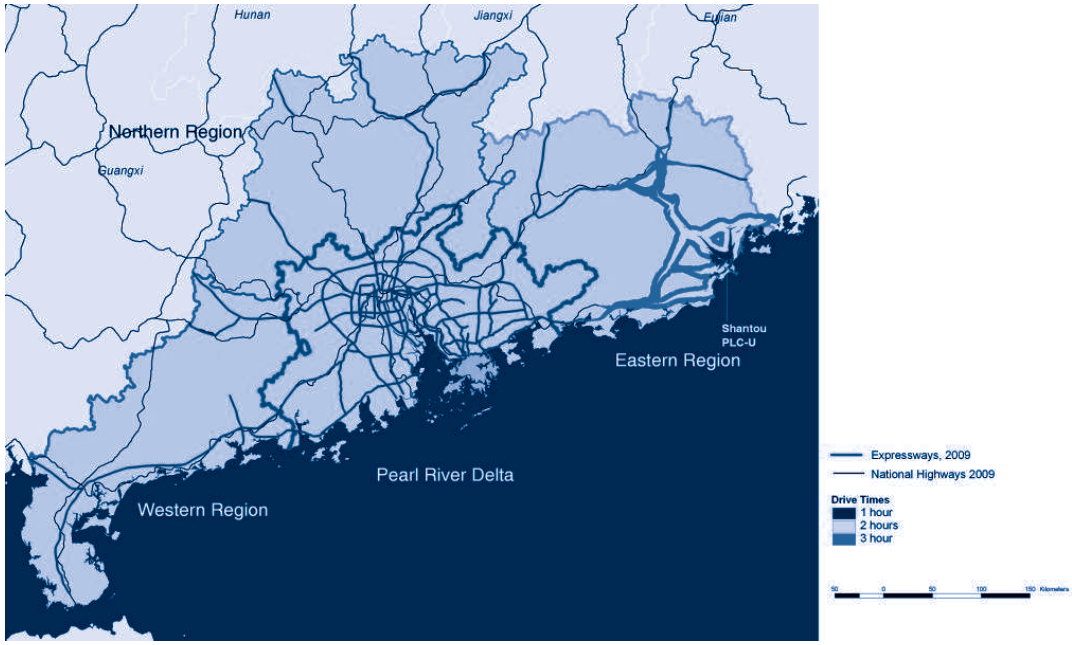
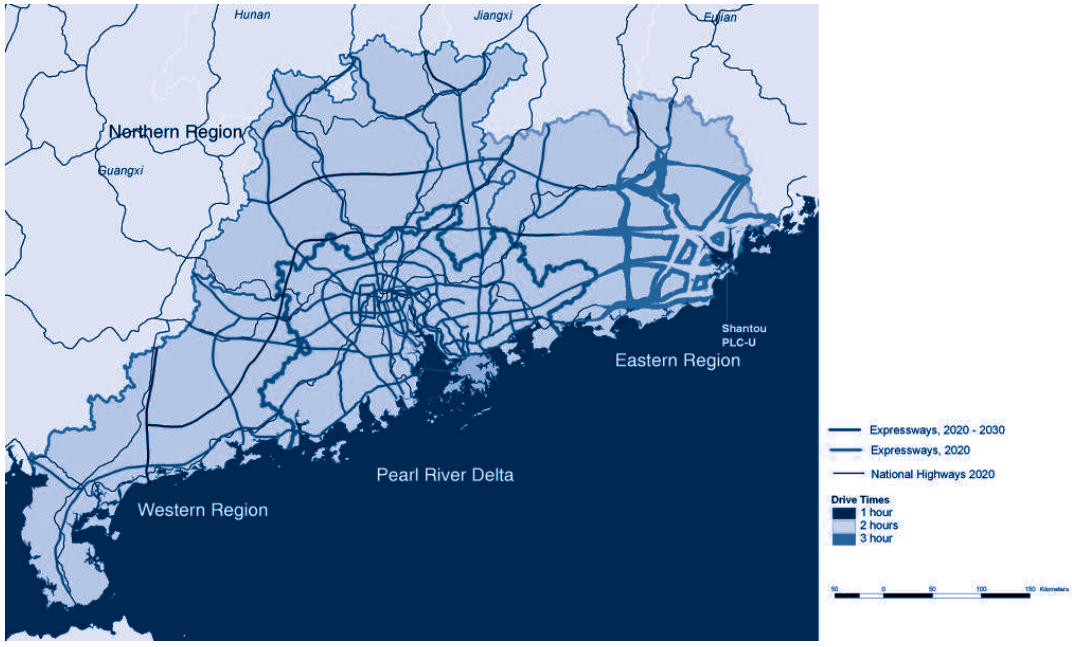


Figure A.18.**Shantou drive times, 2020/2030**



Shaoguan

Shaoguan is the only major city in the less-developed Northern Region. In 1990, its 1-hour catchment area was 299 square kilometres providing access to 267 000 inhabitants (Figure A.19). Its 2-hour catchment of 772 square kilometres held 418 000 people, and its 3-hour catchment of 2 352 square kilometres had a population of just fewer than 700 000 inhabitants.

By 2009, the 1-hour catchment had more than doubled to 700 square kilometres (Figure A.20). Population within this catchment increased by 2.5 times to 697 000 inhabitants. The 2-hour catchment area extended significantly by 4.3 times to 3 350 square kilometres, reaching a population of 1.35 million, 3.2 times the accessible population in 1990. This catchment has extended into Hunan and Jiangxi provinces to the north, and has reached the border of the PRD to the south. The 3-hour catchment area is now 7 778 square kilometres, 3.3 times larger than in 1990.

On completion of the provincial expressway plan, between 2020 and 2030, Shaoguan's 1-hour catchment area will grow slightly to 739 square kilometres with an accessible population of 762 000 (Figure A.21). The 2-hour catchment, however, will extend by 33% to reach 4 445 square kilometres and a population of 1.75 million. The 3-hour catchment will expand by 65% to reach Guangzhou and to cross most of the Northern Region, holding a population of 5.1 million.

These accessibility changes could provide access to input and output markets across much of the Northern Region: by 2020/2030 Shaoguan will be accessible to almost 60% of the region's population within a three-hour drive-time.

Figure A.19.**Shaoguan drive times, 1990**

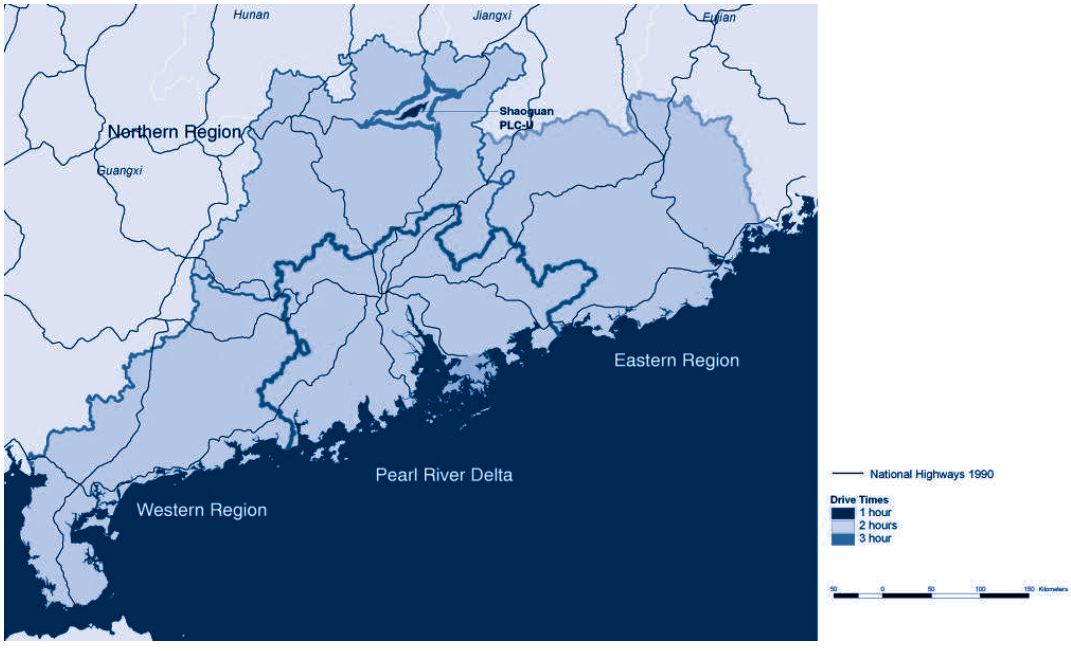


Figure A.20.**Shaoguan drive times, 2009**

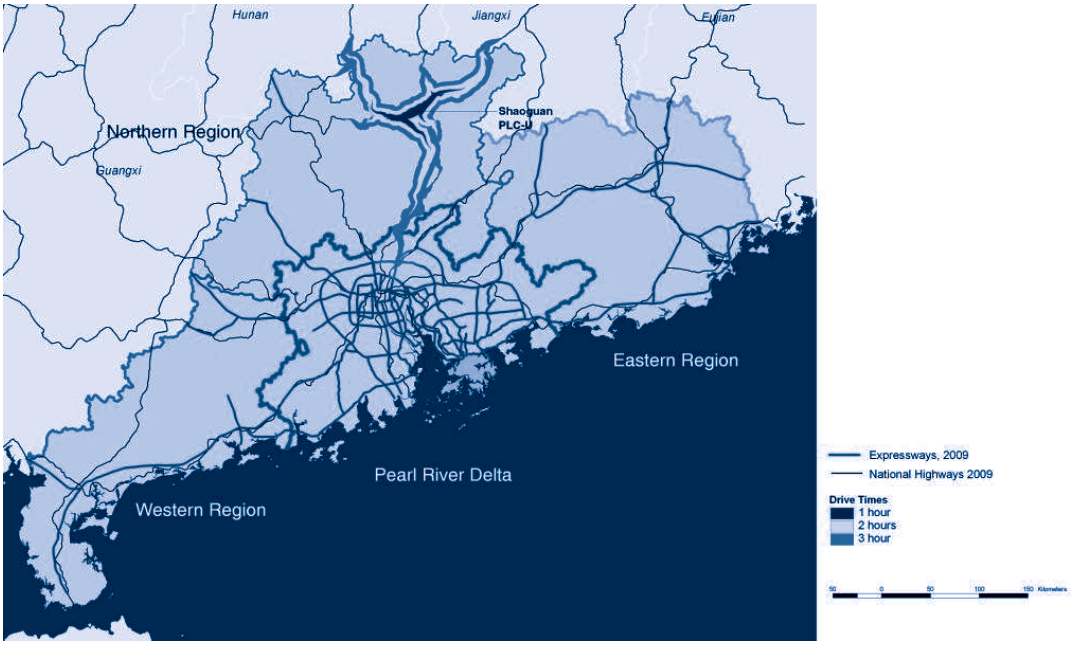
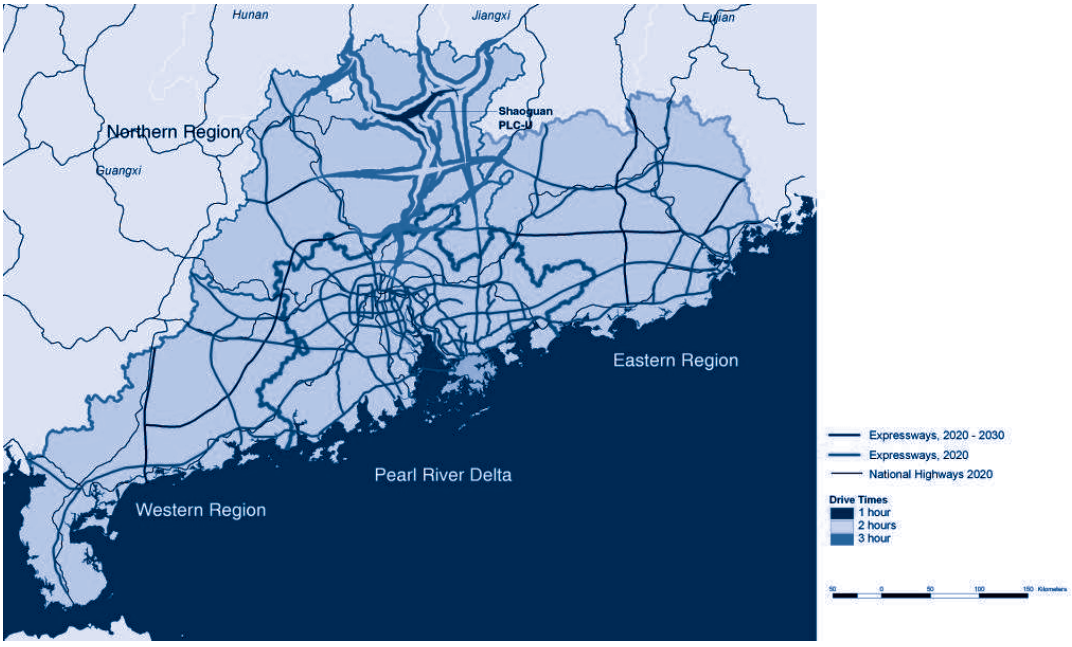


Figure A.21.**Shaoguan drive times, 2020/2030**



Zhanjiang

Accessibility to Guangdong's Western Region is constrained by low population densities and scattered settlement. In 1990, Zhanjiang's 1-hour catchment area covered only 49 square kilometres, holding 270 000 residents (Figure A.22). Its 2-hour catchment was 97 square kilometres, and its 3-hour drive-time area only covered 672 square kilometres.

By 2009, the 1-hour catchment area remain unchanged, and the 2-hour drive-time zone had only expanded by 50% benchmarking the 1990 level to reach 145 square kilometres, by far the smallest 2-hour catchment area of the 8 locations analysed (Figure A.23). Similarly, the 3-hour drive-time zone had grown by only 74% to reach 1 168 square kilometres with an accessible population of 1.48 million.

As reviewed in Chapter 2, the economy of the Western Coastal Corridor, anchored on Zhanjiang, is largely based on offshore oil, gas, and upstream petrochemical industries. Outputs are transported by pipeline, rail, and ocean shipping. Given the dispersed pattern of settlement in the Western Region and Zhanjiang's low level of accessibility, flows of other commodities and goods are far more likely to be channelled through Zhaoqing which has far better access to markets and distribution hubs in the PRD.

Analysis of actual drive-times clearly demonstrates the wide differences in accessibility of locations in the Inner and Outer PRD, Hong Kong, China , and in the Western, Northern, and Eastern Regions of Guangdong[5] (Table A.1).

Figure A.22.**Zhanjiang drive-times, 1990**

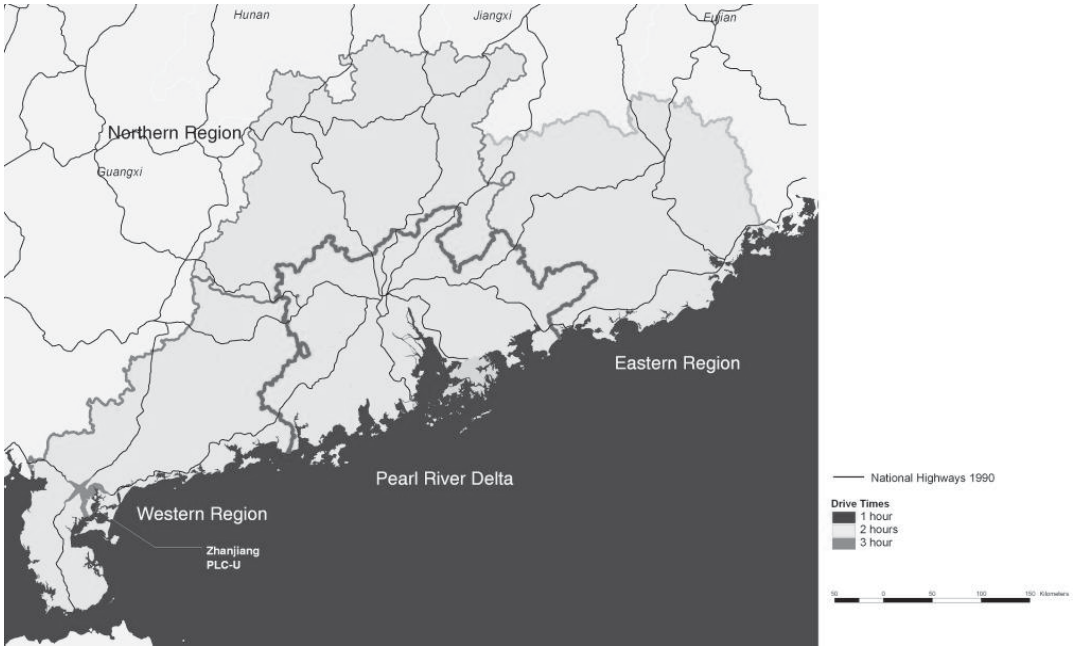


Figure A.23.**Zhanjiang drive-times, 2009**

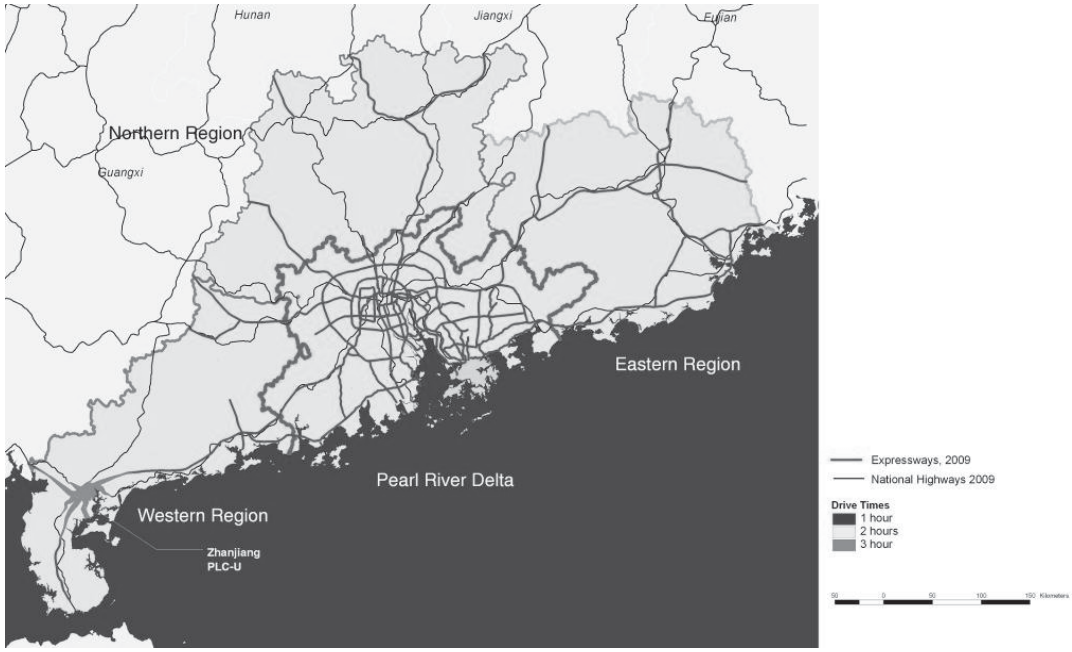


Figure A.24.**Zhanjiang drive-times, 2020/2030**

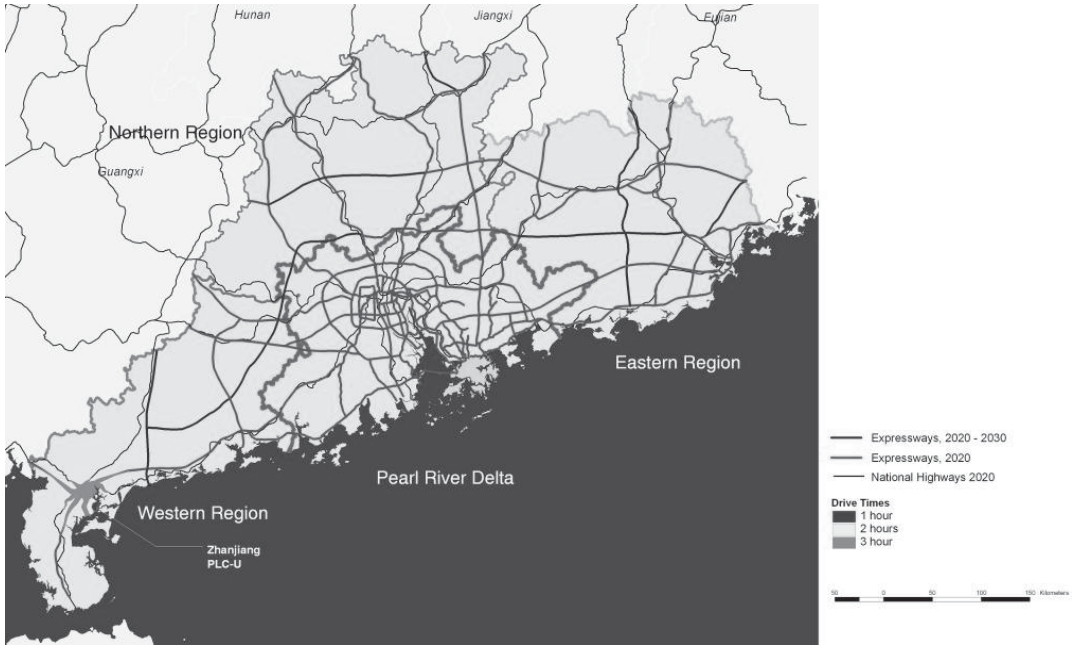


Table A.1. **Accessibility changes in eight strategic locations, 1990-2020/2030**

	1990						2009						2020					
	1 hour drive-time		2 hour drive-time		3 hour drive-time		1 hour drive-time		2 hour drive-time		3 hour drive-time		1 hour drive-time		2 hour drive-time		3 hour drive-time	
	area	population	area	population	area	population	area	population	area	population	area	population	area	population	area	population	area	population
Guangzhou	414	2 919	2 166	5 557	6 380	8 134	985	7 021	10 157	21 686	25 400	40 815	1 066	7 393	11 313	26 366	30 464	53 320
Hong Kong, China	103	3 994	467	5 594	1 091	7 869	1 075	6 914	1 765	14 299	6 110	19 904	1 075	7 719	1 820	16 545	9 322	40 562
Huizhou	234	263	784	550	2 377	1 085	384	834	5 154	8 137	16 413	31 963	382	1 179	5 903	11 995	19 861	40 998
Jiangmen	75	247	221	712	670	769	168	485	5 907	10 841	17 671	33 693	156	524	6 167	12 358	20 062	43 673
Shantou	160	592	761	3 018	2 322	5 862	325	1 475	2 695	6 643	7 491	12 255	357	1 869	3 758	9 912	11 273	16 909
Shaoguan	299	267	772	418	2 352	698	700	663	3 350	1 347	7 778	2 533	739	762	4 445	1 748	12 846	5 176
Zhaoqing	314	390	1 112	702	3 295	1 276	605	657	6 510	9 962	20 335	27 438	608	826	7 435	10 828	24 627	32 085
Zhanjiang	49	269	97	420	672	836	49	430	145	1 484	1 168	1 484	47	535	145	1 850	1 168	1 818

Notes: Area is in square kilometres. Population is in number of thousand inhabitants.

Source: Author's GIS-based calculations.

Notes

1. A one-hour travel time for labourshеds assumes a reasonable degree of mobility either through a well-developed regional transit system (such as in Paris, London and Tokyo) or high rates of private vehicle ownership. Currently, Guangdong has neither, but an extensive regional rail transit network is planned for the PRD, and private vehicle ownership rates are rising dramatically in metropolitan areas. For now, the one-hour drive-time zones should be viewed as a **potential** labourshed in metropolitan areas of Guangdong.

2. A supplier in a three-hour drive-time zone can make a regular (e.g. weekly) delivery in a single working day.

3. Populations were projected to 2020 for each town, township, and street committee using compound annual growth rates from 2000 (National Census data) to 2007 (using PLC-level sample survey results from the Guangdong Bureau of Statistics). For Hong Kong, China and Macao, China projections to 2020 by their respective Census and statistics authorities were applied. For 1990, historical data for Hong Kong, China and Macao, China were applied; for Guangdong, 2000 figures of registered residents were used as a proxy for 1990, e.g. discounting migrants from the 2000 National Census data, since migrant employment was negligible across most of Guangdong at that time.

4. To put this in perspective, the equivalent of 80% of Canada's current population will be accessible within a 2-hour drive from central Guangzhou.

5. All of the drive-time maps in this report are GIS-based calculations by Chreod Group Inc. using roads data from the Ministry of Communications and Guangdong Provincial Development and Reform Commission.

Annex B

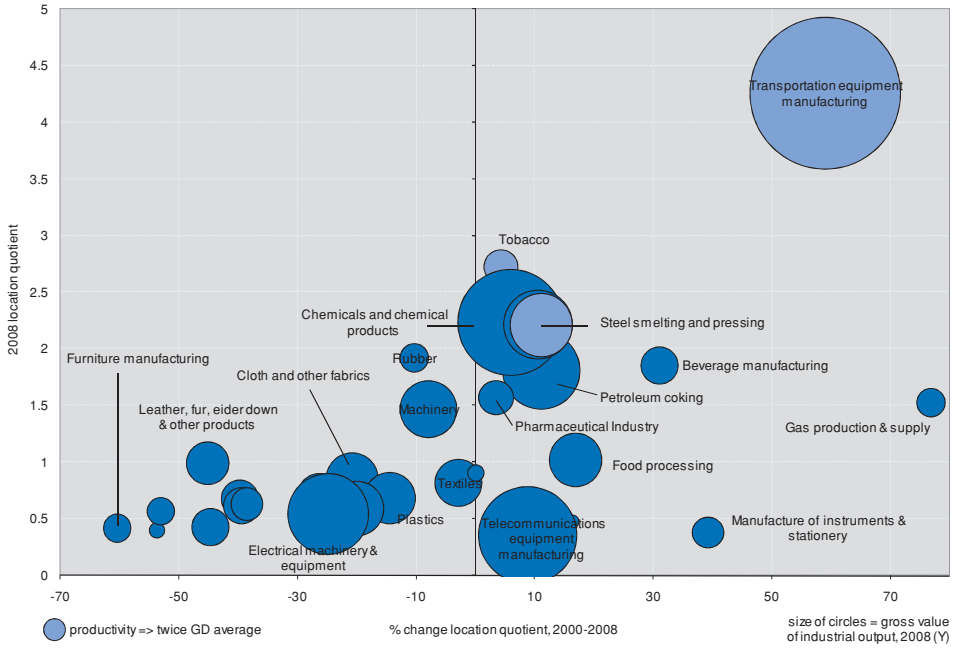
Production capacity of each prefecture in Guangdong

The industrial structure of each PLC has been analysed in terms of: *i*) the volume of gross industrial output value in 2007; *ii*) the industrial sectors' concentration, and trends in concentration from 2000 to 2007, by calculating location quotients of gross industrial output value relative to Guangdong as a whole for both years; *iii*) the productivity of each sector in each PLC in terms of average gross output value per firm; and *iv*) a comparison of these productivity levels against provincial averages. The results are a rough approximation of the relative production capacities in each industry in each of Guangdong's 21 PLCs. The following analysis must be interpreted with caution: the figures show the concentration of industries in each PLC relative to Guangdong as a whole, and the shifts in importance of these industries from 2000 to 2007. They do not necessarily represent industrial clusters as defined by the OECD: many of the PLCs are relatively small, and one or two enterprises can account in these cases for most of their sectors' output. The data are for all state-owned firms, and non-state-owned firms with sales higher than RMB 5 million. Therefore, an unknown number of small firms are missing from the data and the subsequent analysis.

Inner Pearl River Delta

Guangzhou produces 16% of Guangdong's industrial output value. The role of the highly productive automotive sector in the metropolitan economy increased dramatically between 2000 and 2008 (Figure B.1). However, other industries play key roles, especially chemicals, steel, petrochemicals, and food manufacturing. Steel and tobacco are highly productive industries; emerging sectors are instrumentation and telecommunications equipment manufacturing. A large industry experiencing declining importance is electrical machinery and equipment.

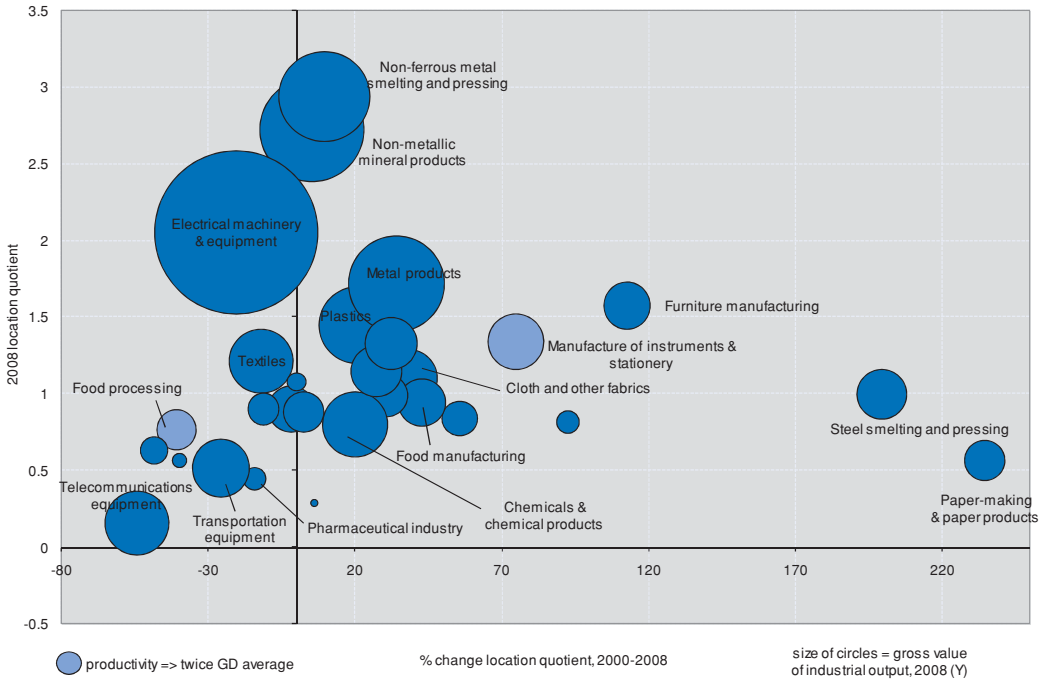
Figure B.1. **Guangzhou industrial profile (Inner PRD)**



Source: All industrial profile charts are calculated from *Guangdong Provincial Statistical Yearbooks*, 2001, 2009.

Foshan's economy is strongly rooted in metal products, non-metallic mineral products, and non-ferrous metal; all are increasing in importance except electrical machinery (Figure B.2). Two rapid developing sectors, in which Foshan is especially productive, are food manufacturing and instrumentation. Of possible concern are declines in relative output of three large industries: electrical machinery and equipment, transport equipment, and telecommunications equipment.

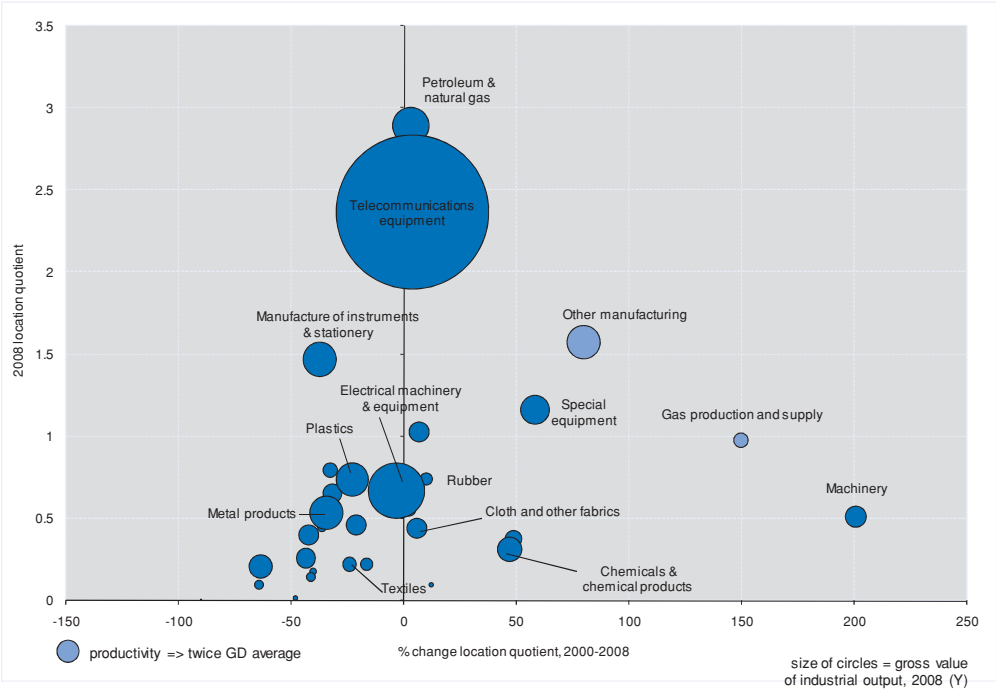
Figure B.2. **Foshan industrial profile (Inner PRD)**



Source: All industrial profile charts are calculated from *Guangdong Provincial Statistical Yearbooks*, 2001, 2009.

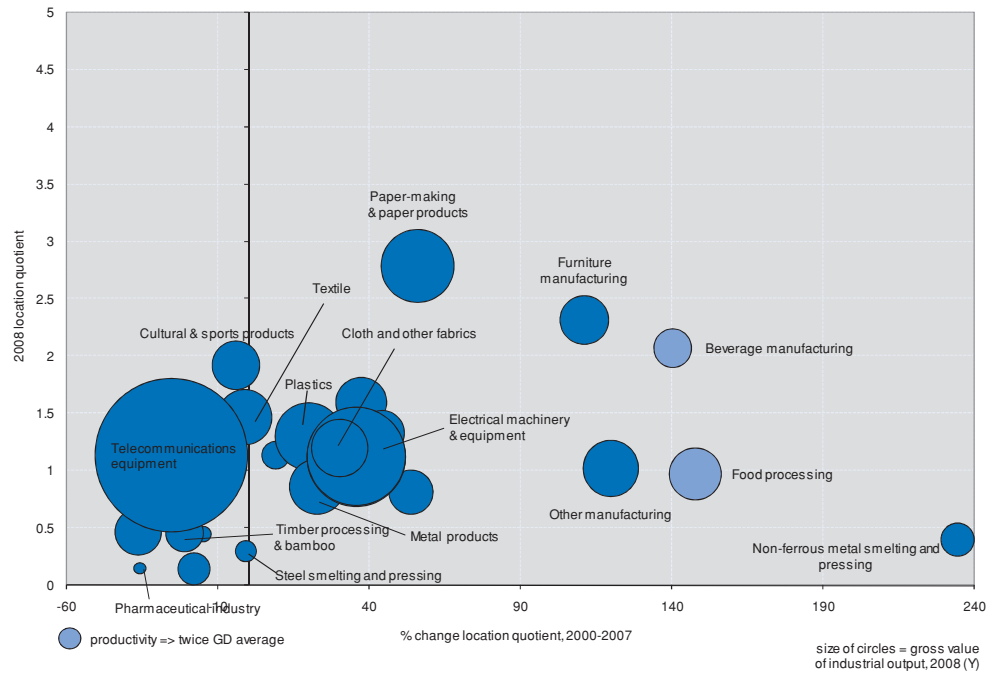
Shenzhen's industrial economy is heavily dominated by telecommunications equipment manufacturing, reflecting the presence of companies such as Huawei (Figure B.3). Emerging industries are in chemicals and chemical products, chemical fabrics, machinery, and special equipment manufacturing, although their current shares of the city's industrial output value are relatively low. Electrical machinery and equipment, textiles, plastics, metal products and other low value-added sectors are declining, reflecting the higher costs of labour and land in Shenzhen. Dongguan is also heavily anchored in telecommunications equipment; its productivity in this sector is actually much lower than Shenzhen's and has been declining (Figure B.4). Textiles and "other manufacturing" (e.g. furniture, paper making, food processing and electrical machinery), beverage and food processing (both highly productive industries) are also important parts of the Dongguan metropolitan economy. Compared to Guangzhou and Foshan, which have a range of industries, both Shenzhen and Dongguan appear to be relatively specialised in far fewer sectors, making them more vulnerable to external shocks such as the current global slump in demand.

Figure B.3. **Shenzhen industrial profile (Inner PRD)**



Source: All industrial profile charts are calculated from *Guangdong Provincial Statistical Yearbooks*, 2001, 2009.

Figure B.4. **Dongguan industrial profile (Inner PRD)**



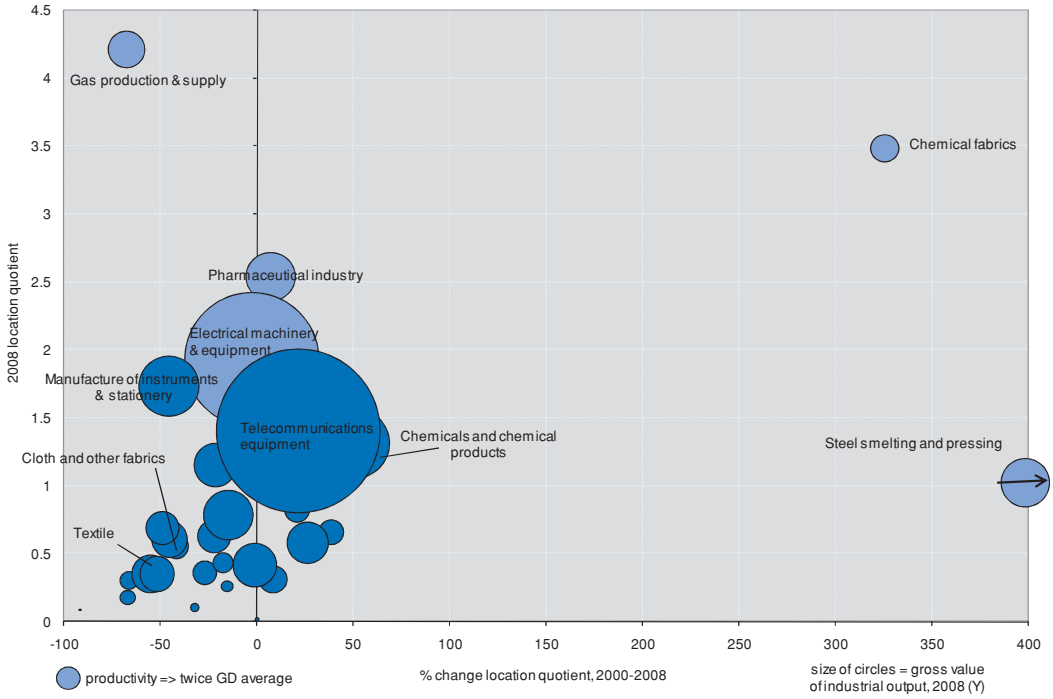
Source: All industrial profile charts are calculated from *Guangdong Provincial Statistical Yearbooks*, 2001, 2009.

Zhuhai's industrial economy is highly concentrated in telecommunications equipment and electrical machinery in which the latter is highly productive in provincial terms (Figure B.5). An emerging industry with high productivity is steel rolling and machining, reflecting production from a new steel plant utilising advanced technologies; this plant is Guangdong's only privately-owned steel facility, and is a foreign joint venture. Other important sectors are the highly productive pharmaceutical industry, and chemical fabrics, an industry that is currently relatively small but growing rapidly.

Zhongshan's industrial economy is much more diversified than Zhuhai's (Figure B.6). The major sectors are also electrical machinery and telecommunications equipment, while the latter has been declining in importance. A large number of other industries, ranging from paper making to furniture to instrumentation, play significant roles and are growing in importance. No industries in Zhongshan are highly productive compared to the provincial average.

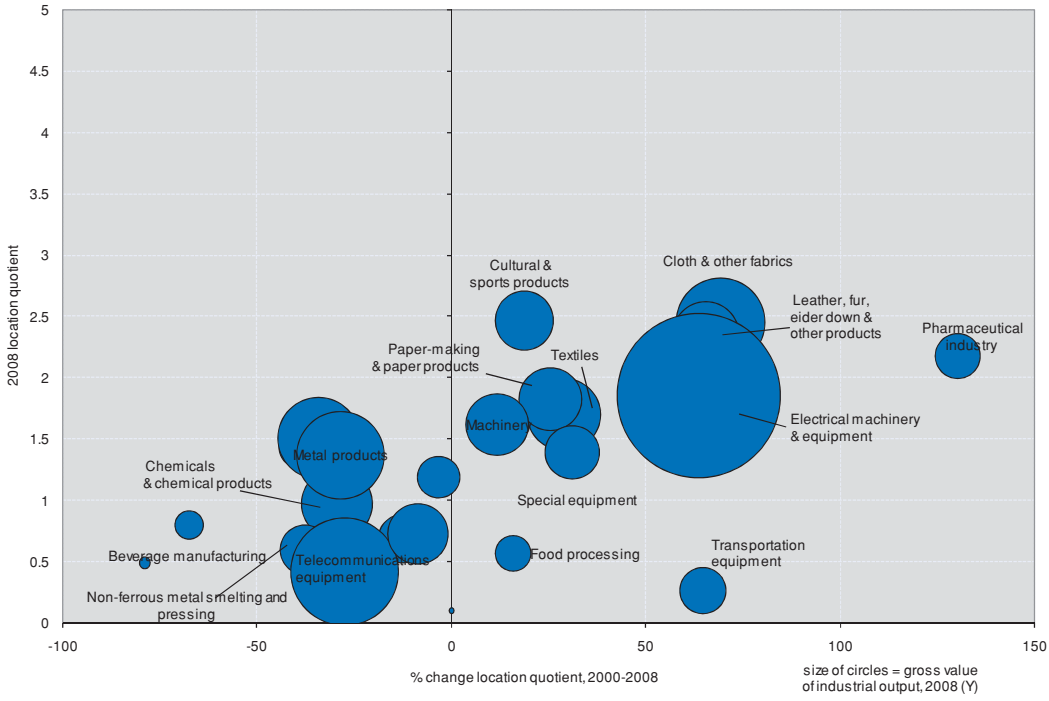
All of the Inner PRD industrial economies have a strong export orientation. Guangzhou, Foshan, and Zhongshan are relatively diversified industrial economies, while Zhuhai, Shenzhen and Dongguan are more specialised and thus more vulnerable to external shocks affecting their industries.

Figure B.5. **Zhuhai industrial profile (Inner PRD)**



Source: All industrial profile charts are calculated from *Guangdong Provincial Statistical Yearbooks*, 2001, 2009.

Figure B.6. **Zhongshan industrial profile (Inner PRD)**

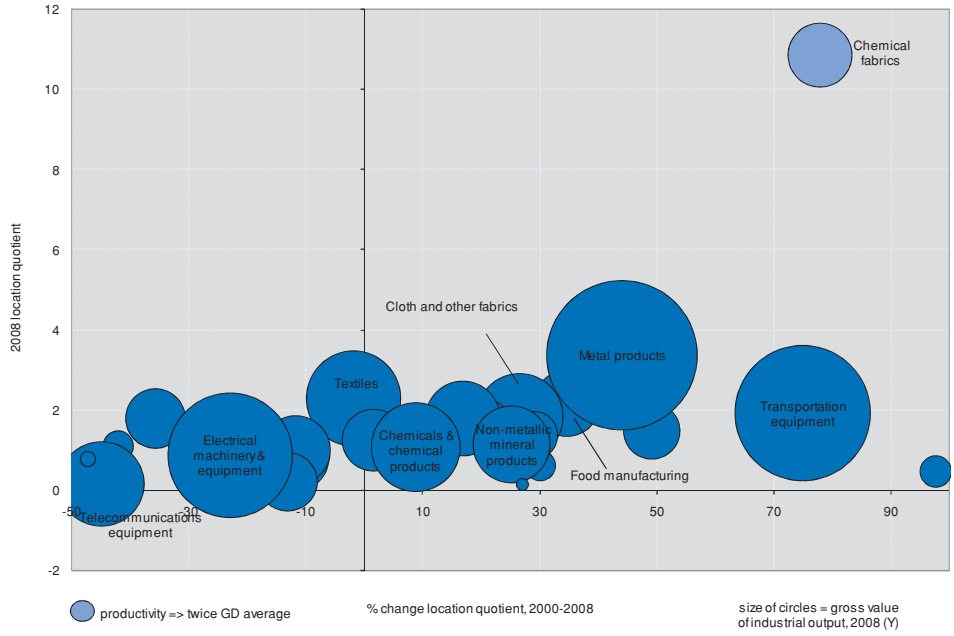


Source: All industrial profile charts are calculated from *Guangdong Provincial Statistical Yearbooks*, 2001, 2009.

Outer Pearl River Delta

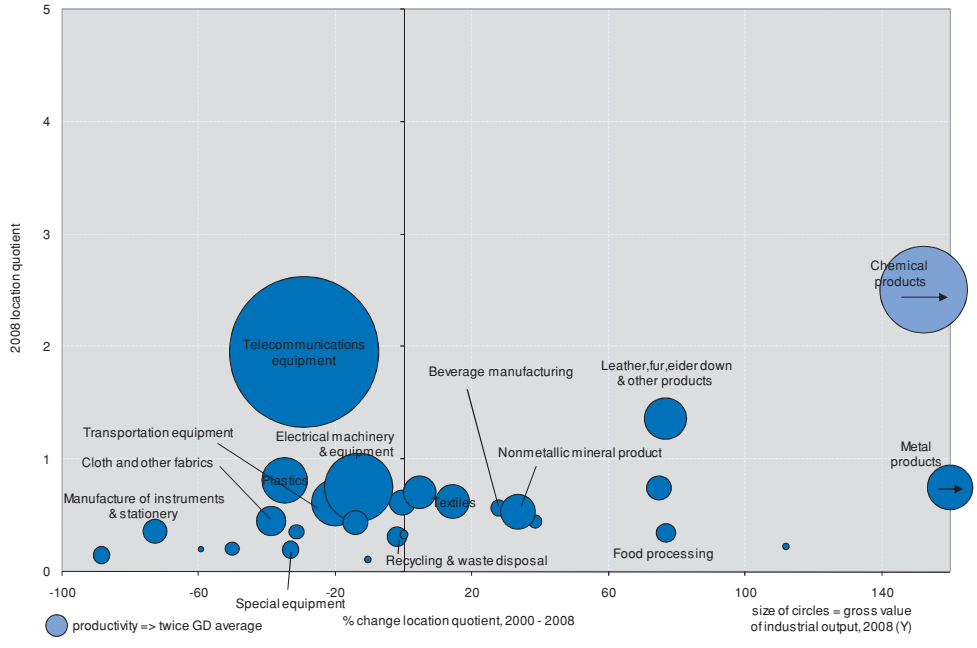
Jiangmen, on the western side of the PRD, has a relatively diversified industrial economy in which transport equipment and metal products play the largest role (Figure B.7). Telecommunications equipment and electrical machinery are also relevant sectors but are declining in importance. None of Jiangmen's industries are especially productive from the provincial perspective, expect chemical fabrics. Huizhou, on the eastern edge of the PRD, has a significantly different economy than PLCs in the Inner PRD and Jiangmen (Figure B.8). It is heavily oriented towards basic processing of raw materials, especially non-metallic minerals and non-ferrous metals. Its relatively large telecommunications equipment sector appears to be declining. However, the chemical products sector seems to be increasing in importance and highly productive.

Figure B.7. **Jiangmen industrial profile (Outer PRD)**



Source: All industrial profile charts are calculated from *Guangdong Provincial Statistical Yearbooks*, 2001, 2009.

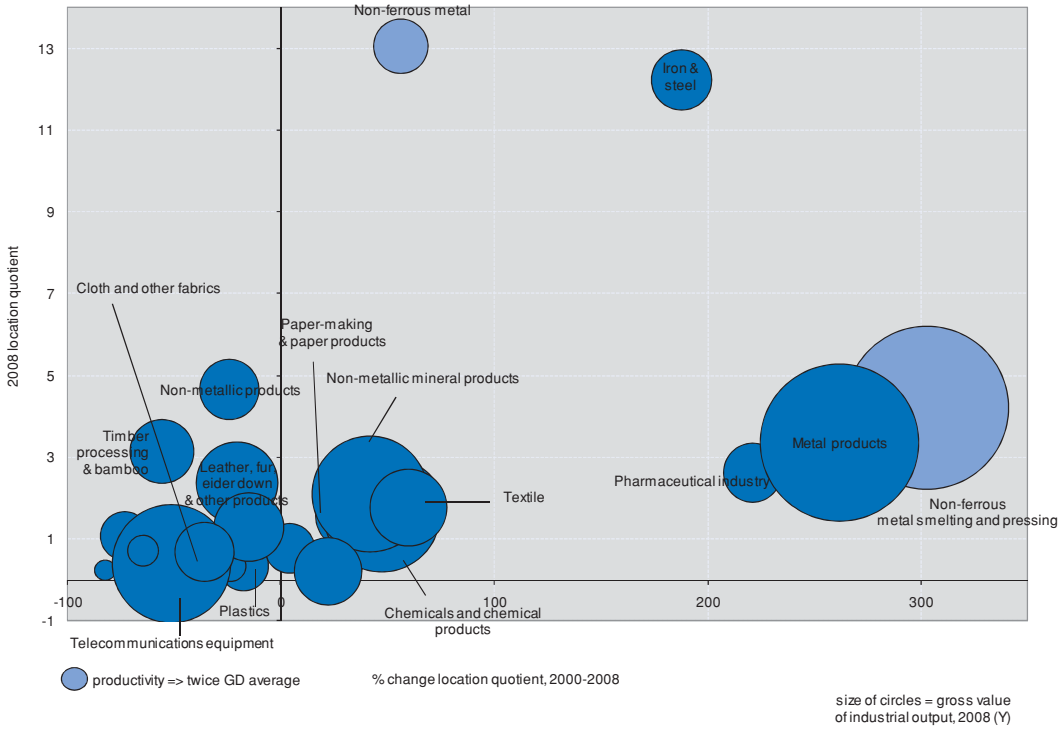
Figure B.8. **Huizhou industrial profile (Outer PRD)**



Source: All industrial profile charts are calculated from *Guangdong Provincial Statistical Yearbooks*, 2001, 2009.

Zhaoqing straddles the northern region and the Outer PRD. It has a diverse industrial economy in which metal products, textiles, non-metallic mineral products and paper production are major sectors (Figure B.9). An important sector concerns the non-ferrous metal sector, which is the largest sector in Zhaoqing and highly productive compared to the provincial average.

Figure B.9. **Zhaoging industrial profile (Outer PRD)**

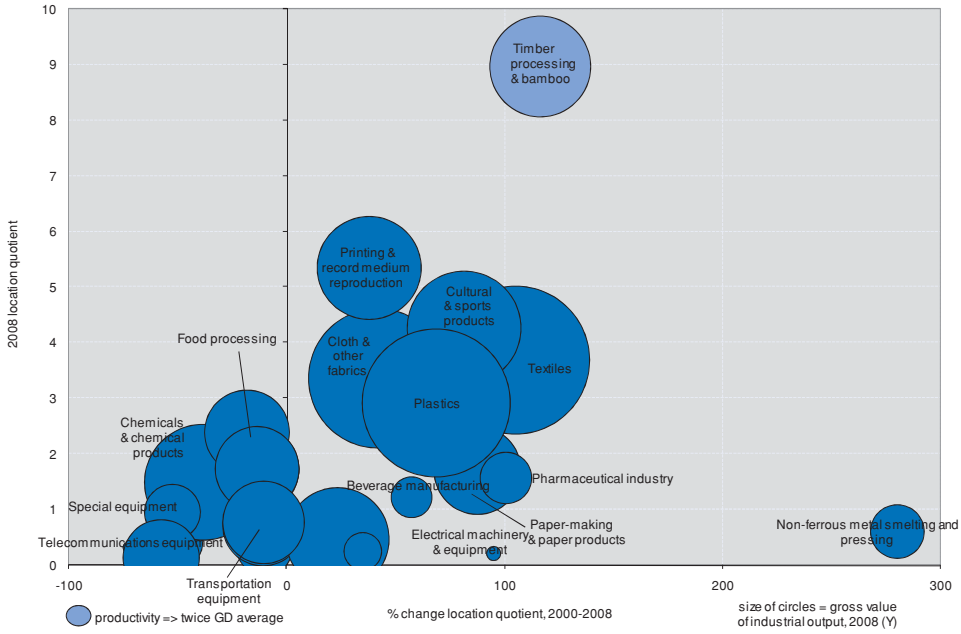


Source: All industrial profile charts are calculated from *Guangdong Provincial Statistical Yearbooks*, 2001, 2009.

Eastern Region

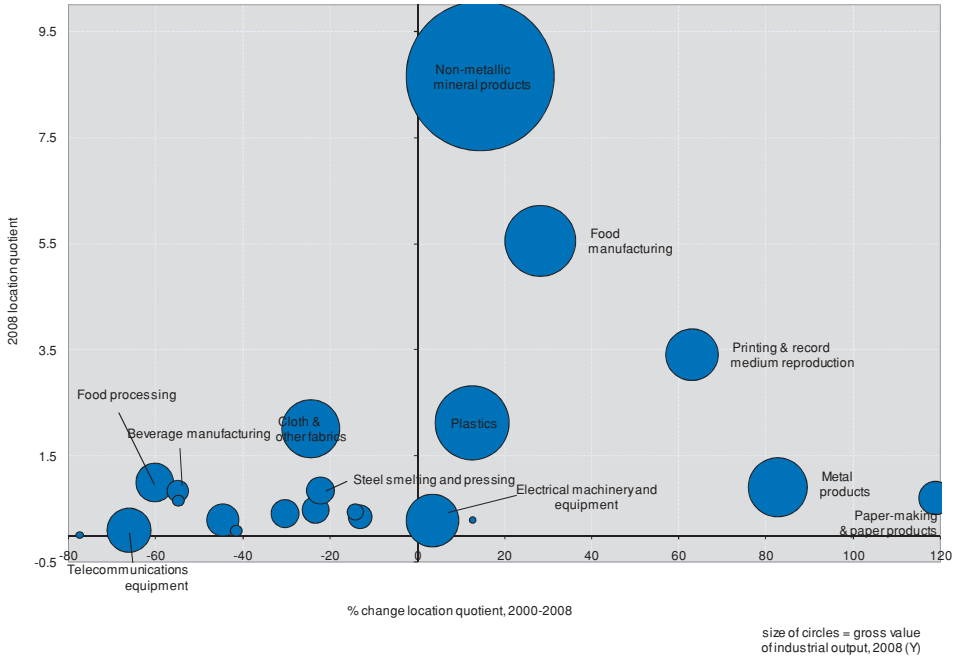
Although they are spatially clustered, Shantou, Chaozhou, and Jieyang have quite different industrial economies. Shantou is highly diversified and strong in textiles, plastics, toys and decorations, paper, and timber processing, which is provincially highly productive (Figure B.10). Its relatively significant chemicals, transportation equipment, and telecommunications equipment appear to be declining. All three are comparatively capital- and technology intensive. Chaozhou is highly dependent on non-metallic mineral products, essentially in ceramics where 4 000 ceramics-producing enterprises employ over 70 000 workers. It has been a nationally important ceramics base for more than 1 300 years. Paper, metal products, food manufacturing and plastics are significant and growing industries (Figure B.11). Declining industries appear to be steel and telecommunications equipment.

Figure B.10. **Shantou industrial profile (Eastern Region)**



Source: All industrial profile charts are calculated from *Guangdong Provincial Statistical Yearbooks*, 2001, 2009.

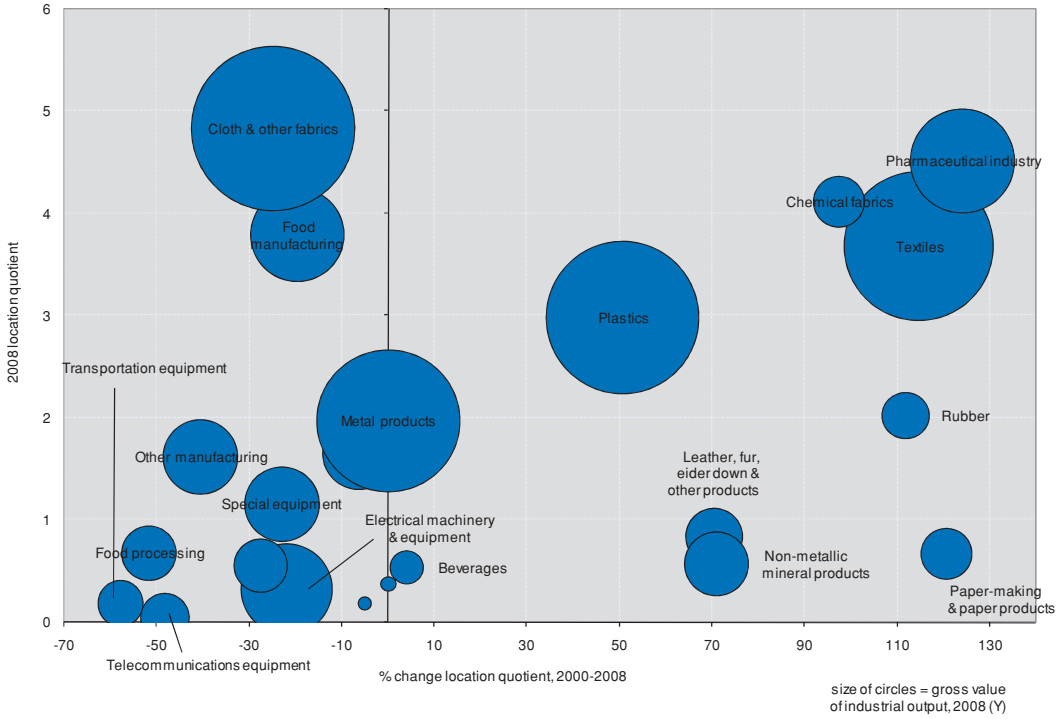
Figure B.11. **Chaozhou industrial profile (Eastern Region)**



Source: All industrial profile charts are calculated from *Guangdong Provincial Statistical Yearbooks*, 2001, 2009.

Jieyang has one of the most diversified industrial economies in Guangdong (Figure B.12). Textiles, cloth and other fabrics, plastics, metal products, and the pharmaceutical industry are dominant industries; cloth and other fabrics and food manufacturing are important sectors but appear to be in decline. Technology-intensive industries (telecommunications equipment, special equipment, electrical machinery, and transport equipment) are smaller sectors and are in decline.

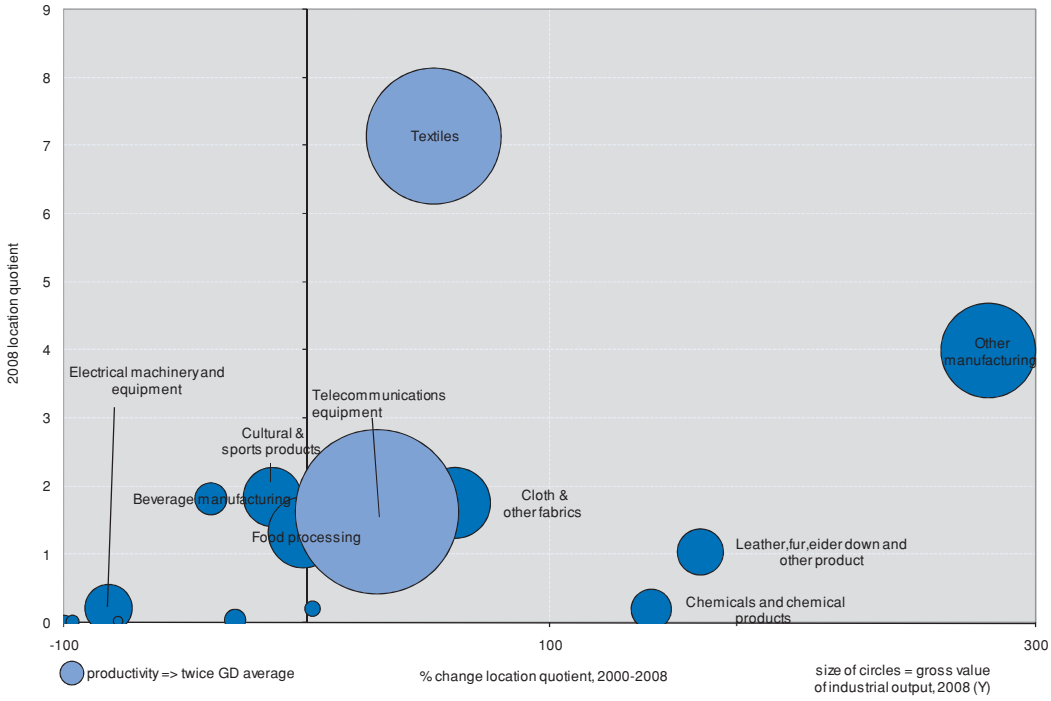
Figure B.12. **Jieyang industrial profile (Eastern Region)**



Source: All industrial profile charts are calculated from *Guangdong Provincial Statistical Yearbooks*, 2001, 2009.

Shanwei has a small industrial economy dominated by telecommunications equipment and textile, both of which are also highly productive. Cloth and other manufacturing industries have grown markedly between 2000 and 2008 (Figure B.13). All other industrial sectors appear to be in decline.

Figure B.13. **Shanwei industrial profile (Eastern Region)**

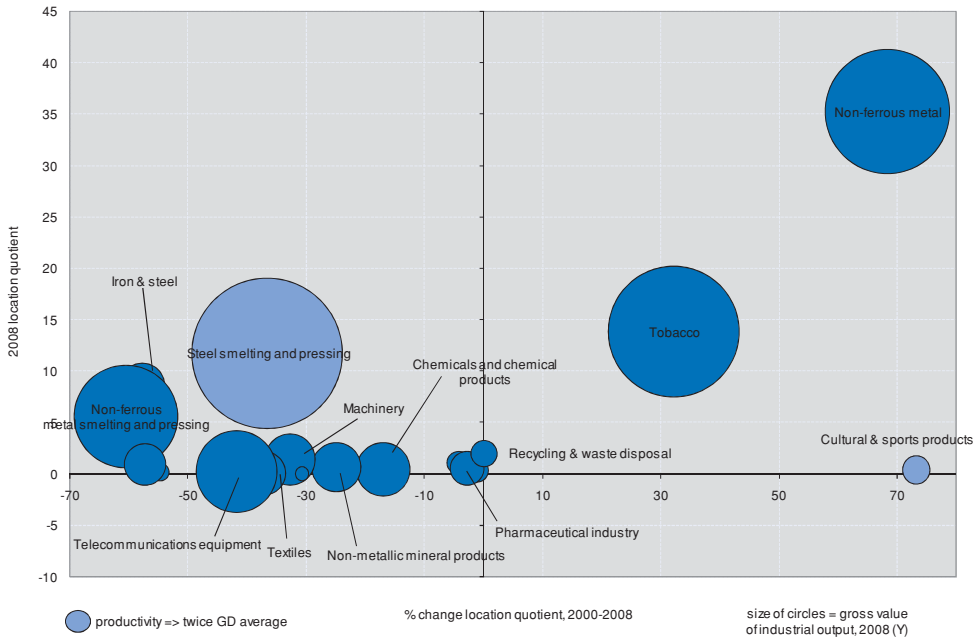


Source: All industrial profile charts are calculated from *Guangdong Provincial Statistical Yearbooks*, 2001, 2009.

Northern Region

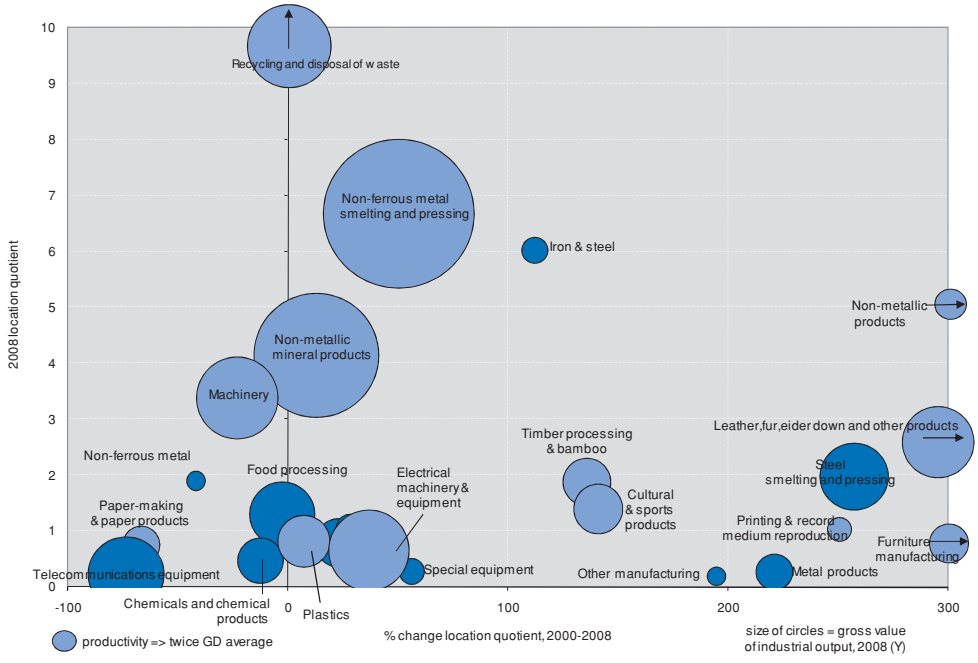
Shaoguan is northern Guangdong's heavy industry base with strong performance in non-ferrous metal and tobacco (Figure B.14). Shaoguan's largest industry is steel rolling and machining, which is also highly productive compared to the provincial standard. Qingyuan has a diverse industrial economy that is highly productive in non-ferrous metals processing, non-metallic mineral production, machinery, leather products, furniture manufacturing, electrical machinery, cultural products. All these sectors drove the rapid growth of Qingyuan over 2000-2008 (Figure B.15).

Figure B.14. **Shaoguan industrial profile (Northern Region)**



Source: All industrial profile charts are calculated from *Guangdong Provincial Statistical Yearbooks*, 2001, 2009.

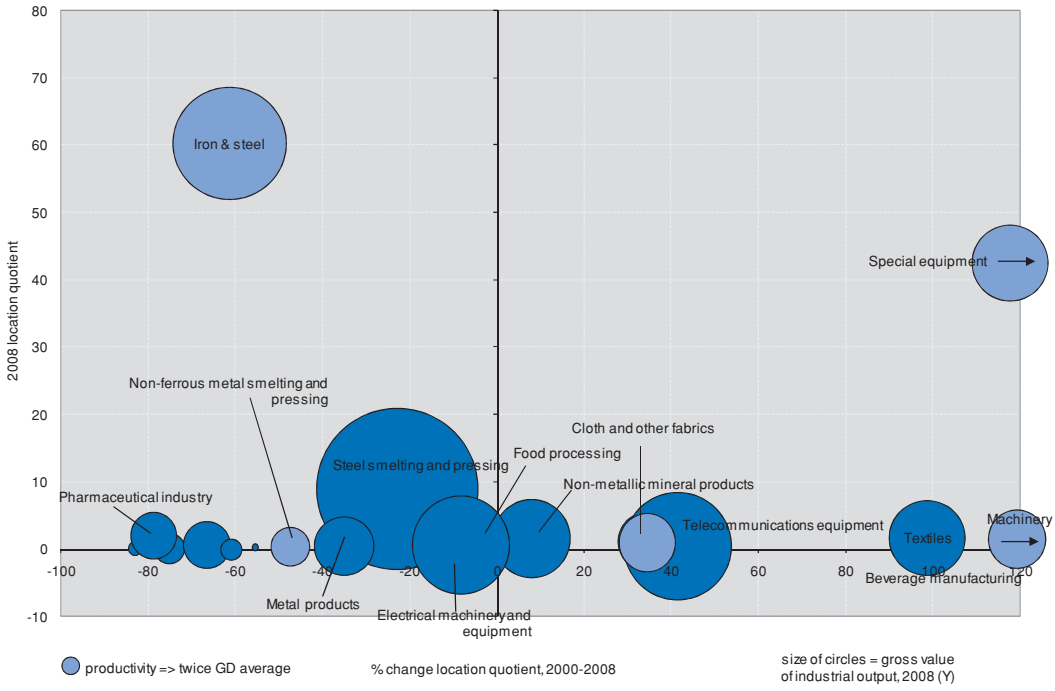
Figure B.15. **Qingyuan industrial profile (Northern Region)**



Source: All industrial profile charts are calculated from *Guangdong Provincial Statistical Yearbooks*, 2001, 2009.

Heyuan is strongly dominated by steel production. Although highly productive from a provincial perspective, many plants are apparently antiquated and highly polluting: the city has in recent years closed down 19 such plants that produced 1.38 million tons per year. Other promising industries are special equipment, machinery, cloth fabrics, which are also highly productive compared to the provincial standard (Figure B.16).

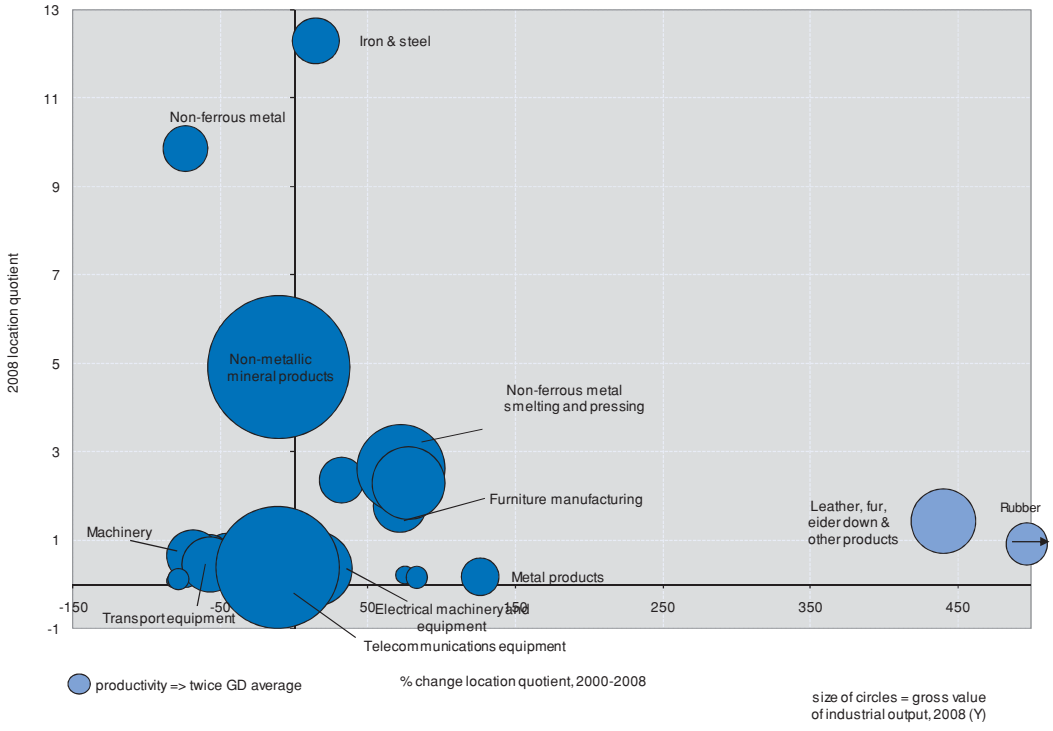
Figure B.16. **Heyuan industrial profile (Northern Region)**



Source: All industrial profile charts are calculated from *Guangdong Provincial Statistical Yearbooks*, 2001, 2009.

Meizhou has a more diverse economy with high productivity in leather products and rubber sectors both of which are growing in importance (Figure B.17). A dominant sector is the non-metallic mineral product sector. Telecommunications equipment manufacturing is a large sector, but not particularly significant provincially; it did not change appreciably in importance from 2000 to 2008.

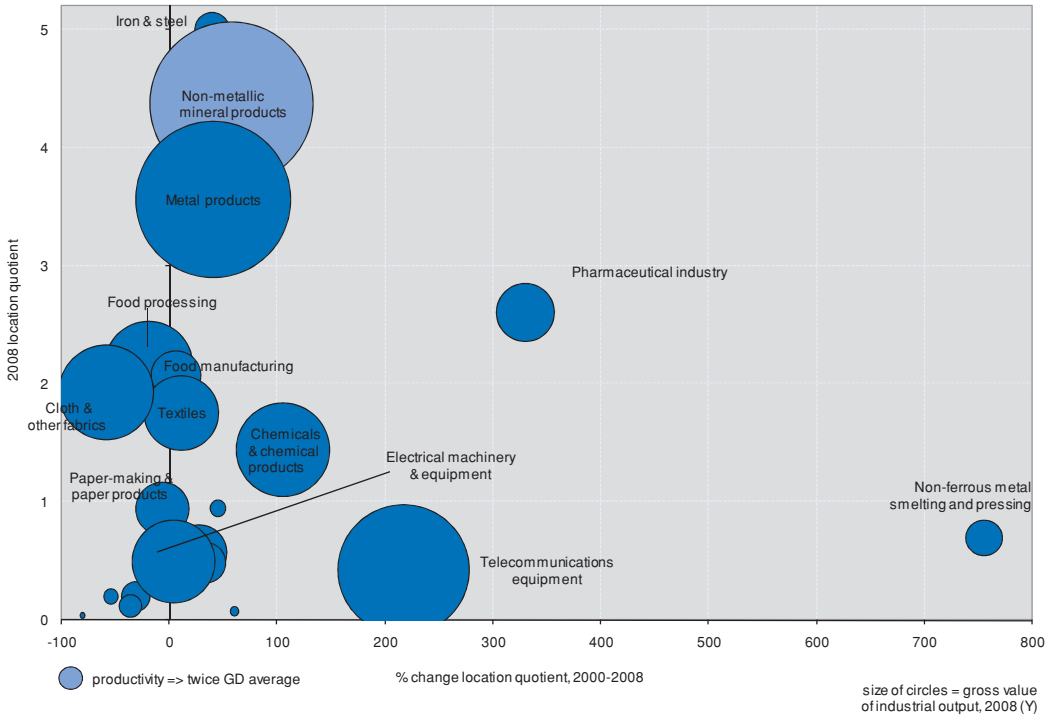
Figure B.17. **Meizhou industrial profile (Northern Region)**



Source: All industrial profile charts are calculated from *Guangdong Provincial Statistical Yearbooks*, 2001, 2009.

Yunfu is a major centre for stone production (non-metallic mineral products) in Guangdong, which is also highly productive (Figure B.18). The metal products industry is very significant, and telecommunications equipment appears to be growing in importance.

Figure B.18. **Yunfu industrial profile (Northern Region)**

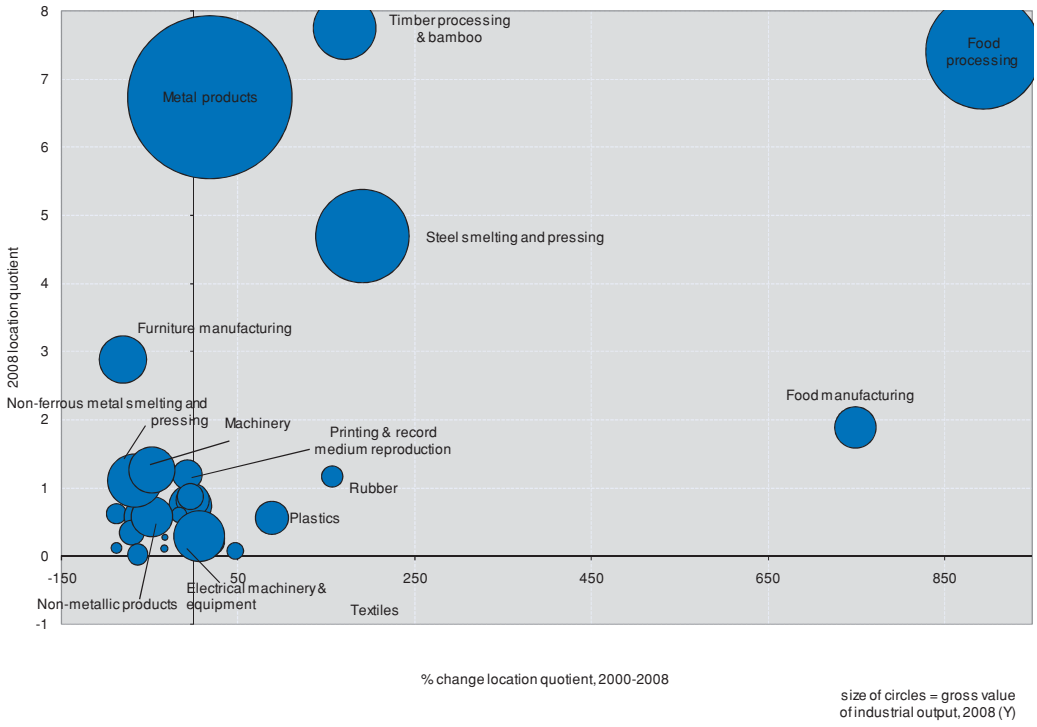


Source: All industrial profile charts are calculated from *Guangdong Provincial Statistical Yearbooks*, 2001, 2009.

Western Region

Yangjiang has a specialised industrial economy with high concentration in metal products and food processing, and steel rolling. (Figure B.19). Many industrial sectors appear to be in decline. None of the industries are especially productive from the provincial perspective.

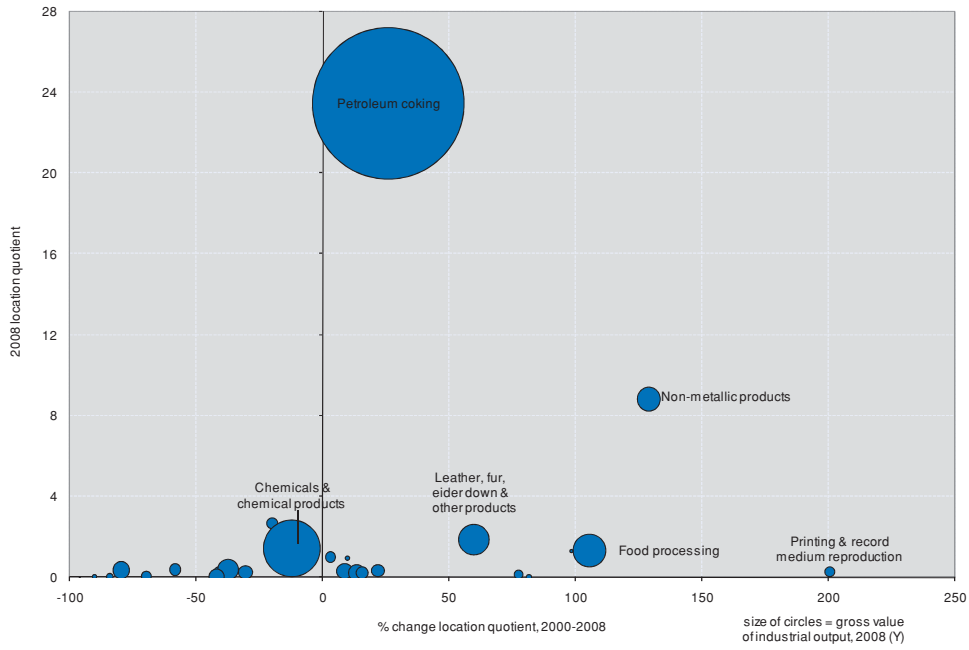
Figure B.19. **Yangjiang industrial profile (Western Region)**



Source: All industrial profile charts are calculated from *Guangdong Provincial Statistical Yearbooks*, 2001, 2009.

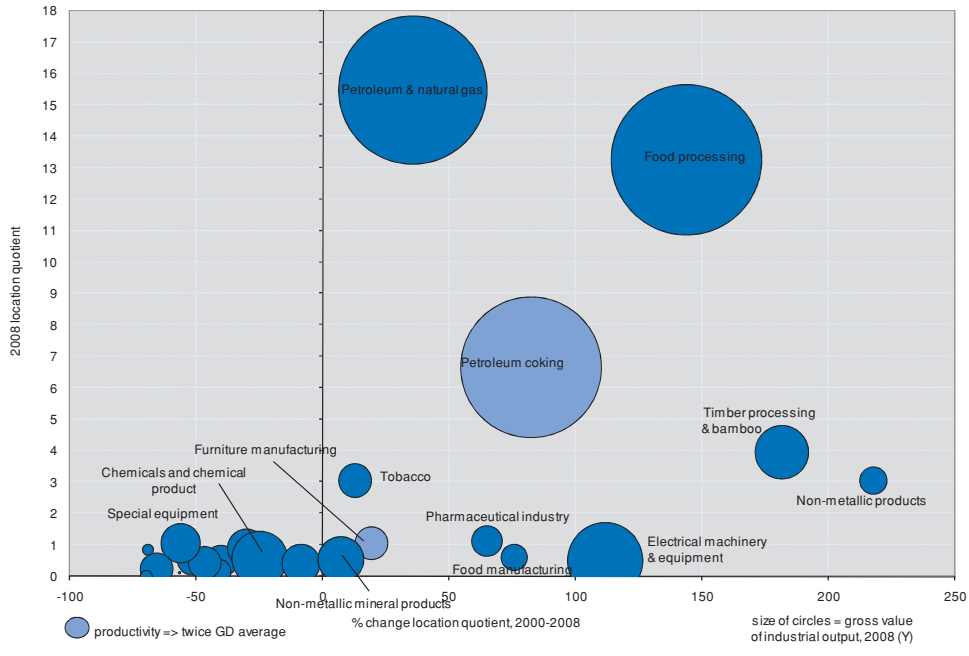
Maoming is essentially a single-industry city in the petrochemicals sector (Figure B.20). As described earlier, Sinopec has developed its second largest refinery in China in Maoming. Zhanjiang also has a relatively specialised economy, focusing on food processing, petroleum and natural gas, and petrochemicals (Figure B.21). The latter is highly productive from the provincial perspective. Many of its smaller industries appear to be in decline.

Figure B.20. **Maoming industrial profile (Western Region)**



Source: All industrial profile charts are calculated from *Guangdong Provincial Statistical Yearbooks*, 2001, 2009.

Figure B.21. **Zhanjiang industrial profile (Western Region)**



Source: All industrial profile charts are calculated from *Guangdong Provincial Statistical Yearbooks*, 2001, 2009.

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GUANGDONG, CHINA

Located on the southern coast of China, Guangdong is the country's most populous and rich province. It has 95.4 million inhabitants and provides one-eighth of the national GDP. A key development feature of Guangdong has been "processing trade", which has allowed companies to profit from importing materials, assembling goods and exporting them via Hong Kong, China.

The recent economic crisis has had a strong impact on the province, although Guangdong also faces in-depth structural problems. Growing labour costs and strain on land availability have increasingly challenged the province's traditional model of development, as have new competitors in China and abroad. Meanwhile, regional disparities within the province have increased, with a high concentration of economic activities and foreign direct investment in the Pearl River Delta area, an agglomeration of nine prefectures of 47.7 million inhabitants that represents 79.4% of the province's total GDP.

This review assesses Guangdong's current approach to economic development. The province is focusing on industrial policies primarily aimed at heavy manufacturing industries (e.g. automobile, shipbuilding, petrochemicals) and supported by investment in hard infrastructure transport projects and energy supply, along with the implementation of the "Double Relocation" policies intended to move lower value-added factories to lagging regions through incentive mechanisms like industrial parks.

The review discusses how some principles of the OECD regional paradigm could help Guangdong. It also addresses the huge environmental challenges that the province is facing and explores the opportunity for developing a green growth strategy. Strategies to improve Guangdong's governance are analysed as well, with particular attention paid to co-ordination issues within the Pearl River Delta.

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